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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION."

Volume 12 SACRAMENTO, JANUARY, 1926 Number 1

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THE ECONOMIC VALUE OF BIRDS.

By Harold C. Bryant.

The economic or dollar and cents value is but one of the values pertaining to bird life. At present this is the value most emphasized but it is not necessarily the only basis for an estimate of a bird's worth. It is to be hoped that a basis of valuation which takes into account all tangible values will be more widely used in the future. However, this presentation will be limited to some of the outstanding values of bird life from the dollar-and-cents viewpoint.

As a rule we have decided upon a bird's value entirely upon circumstantial evidence. If a bird were found in a field it was at once supposed that it was eating grain. If a bird were seen in an orchard tree, it was at once supposed to be eating fruit and so immediately

blacklisted. In more immediate years, an attempt has been made to base valuation on more dependable information. Consequently, we find men now engaged in the study of the food of birds attempting to find exactly what a bird does in the open and exactly what it eats.

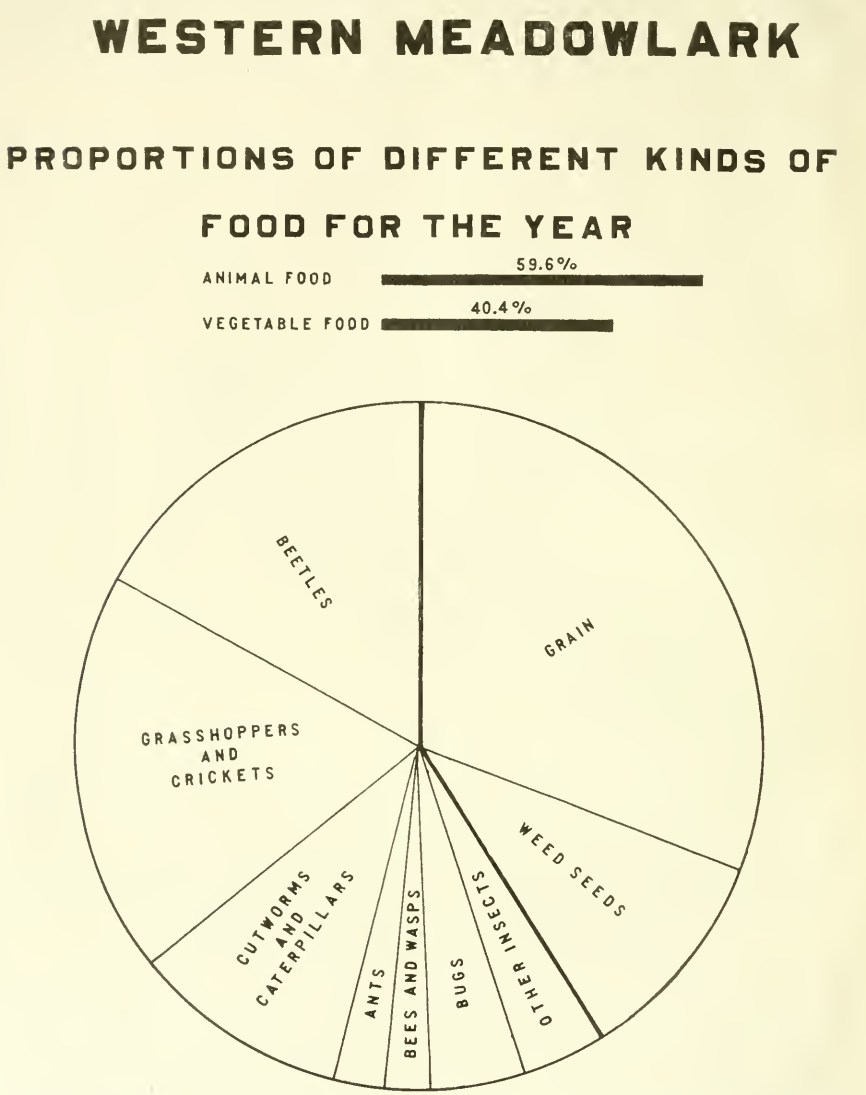

FIG. 1. Diagram showing relative amounts of various items in the diet of the western meadow lark as computed after a study of the stomach contents of nearly two thousand birds taken at all seasons of the year.

A Frenchman was the first to actually show what a bird eats by exhibiting the stomach contents. He prepared charts by pasting the different elements of food on cardboard. This evidence was shown to the French Academy of Science, to demonstrate exactly what various

birds were eating in France. Then a man in New Jersey adopted this method of stomach examination and investigated the food of the robin.

In 1895, the Federal Government became interested in placing a valuation on our common song birds. A bureau of the United States Department of Agriculture undertook some investigations of the food habits of birds. Investigation continued until now there is a mass of literature dealing with the food of birds. Over one hundred thousand stomachs of birds have been examined by the Bureau of Biological Survey alone. Data on the food of almost any North American species is available. A bibliography dealing with articles on the food of birds in North America by W. L. McAtee (U.S.D.A., Biological Survey Bull. 43) is available and will furnish abundant references for those interested.

If we study the matter we find that birds occupy a very important place so far as control of insects is concerned. There is a wonderful balance in nature. Were it not for the tree, certain insects could not live; if it were not for the insects, certain birds could not exist; and in turn, but for certain birds the trees could not exist because of the control of the insects by these birds. True, birds are not the only check on insects. Parasites, climatic conditions and other factors form checks on insects, but birds do play a part and a very important part in insect control. It has often been pointed out that if insects were not held in check they would soon populate the earth. In some instances, thirteen broods of young are reared each year and the increase is tremendous. There are said to be 400 insects injurious to the oak, 165 injurious to the pine and 186 injurious to the willow. What chance would the trees have if insects were allowed to propagate unchecked!

The following proofs that birds act as an important check on insect life are offered: *First of all most birds eat insects, and some birds eat nothing but insects.* Many birds that feed upon weed seeds or grain during the winter season always turn their attention to insects during the spring when they are feeding their young. Many birds appear to turn their attention to grain only in winter when insects are not available. Examination of thousands of stomachs of such birds as wrens, flycatchers and swallows show that these birds feed entirely upon insects. More than 99 per cent of the food for the entire year for these birds is made up of insect food.

Along with this continual demand for insect food on the part of the bird we discover some very interesting adaptations for the catching of insects. The flycatchers, for instance, have rather broad flattened bills with which to snap up insects. An additional aid in capturing insects in the air is to be found in some hair-like bristles at the corners of the mouth; these really increase the size of the mouth and the bird is enabled by them to know when it has captured an insect, or when an insect is about to escape.

Birds known as nighthawks, in reality not hawks at all, sometimes called "goatsuckers," have very large mouths. In the evening these expert flyers capture insects in mid-air with but slight deviations in their flight.

The hummingbirds have a very long slender bill adapted for searching in the cups of tubular flowers. They do not feed entirely upon nectar but also upon insects found in the corollas of flowers.

Woodpeckers have wonderfully adapted structures which enable them to secure insect larvae from beneath the bark or even down in the wood of the trees. First of all they can cling to the side of the tree. Their feet, instead of having three toes forward and one backward, as is the case with most birds, have two forward and two backward, so they are enabled in this way to clamp pincher-like onto the side of the tree. The tail feathers are strong, stiffened and pointed to act as a support, for the woodpecker in reality becomes a shelf on the side of a tree. The bill is chisel-like. Strong muscles in the head and neck allow the bird to deliver rapid and strong blows against the side of the tree, sufficient to chip off the bark or even the wood itself. The tongue of a woodpecker is long and is arranged in such a way that it can be protruded a long distance out of the mouth. The hyoid cartilages extend from the base of the tongue back over the

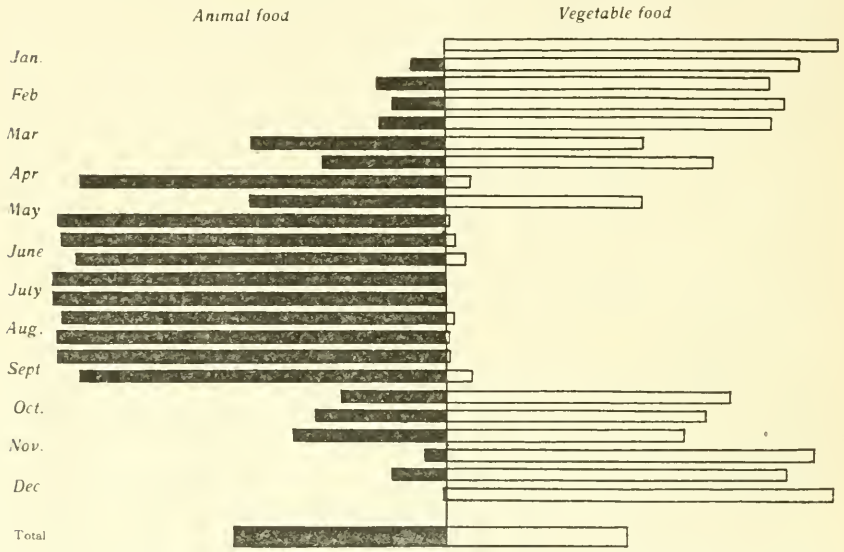

FIG. 2. Diagram showing the change from animal to vegetable food during late fall and winter. Computed after stomach examination of a series of western meadowlarks taken at Newman, Stanislaus County, California.

top of the head in a little groove and each cartilage then terminates below the eye or in some species near the tip of the bill, after passing through one nostril. These cartilages act like a spiral watch spring uncurling and allowing the tongue to protrude much beyond the tip of the bill. Almost no other bird has such a long tongue, a tongue capable of reaching deeply into the tunnel of a wood-borer. At the tip of the tongue are found some little barbs with which to impale the larva when it is found.

Next, *birds have a great capacity for food,* and consume large quantities of it. Attempts have been made to find out exactly how much food birds need. The easiest way to determine this was to hold young birds in captivity and by weighing the food find out just how much they needed. One man experimented with young robins. He found that a robin one week old would eat 31 cutworms and earth-

worms in a day. On its 16th day, he fed each bird 68 earthworms which amounted to over one-half the weight of the bird's body. Another man worked with crows; he found that young birds before they leave the nest need at least one-half their own weight of food every day in order to survive. Estimates have been secured also by watching birds as they feed their young and counting the number of trips made to the nest. In the eastern United States a red-eyed vireo's nest was watched for ten hours during which time the two parent birds made 125 trips to the nest. One of the best records, however, was that made by a pair of grosbeaks, in the eastern United States, which made 426 trips to the nest inside of eleven hours. Caterpillars formed the main item of food. A pair of chipping sparrows succeeded in carrying food to their young on 182 different occasions during one day.*

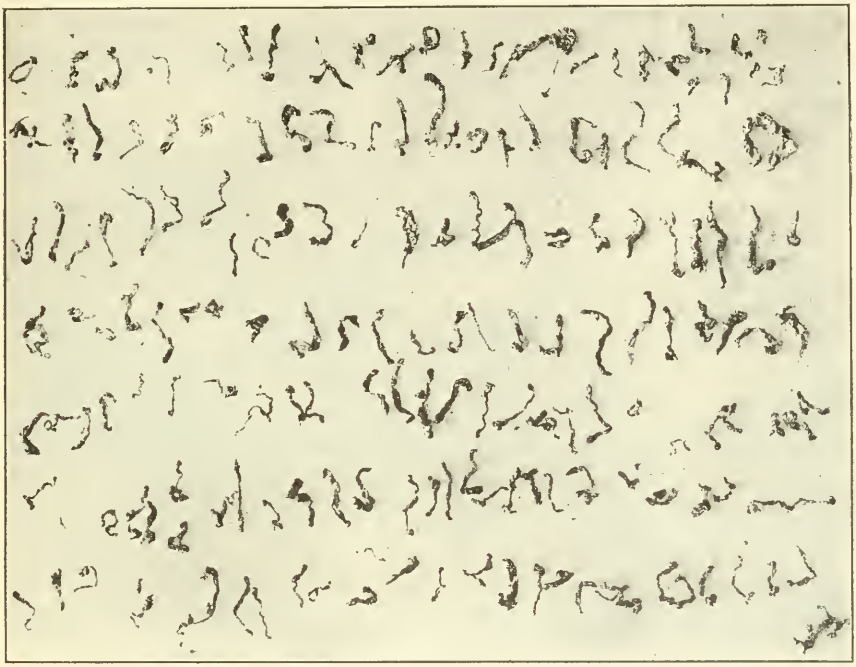

FIG. 3. The 192 small cutworms shown above were taken from the stomach of a western robin secured in Inyo County, California.

We have still another method of estimating the food necessary for a bird. This is by ascertaining the amount of food in a bird's stomach and then determining the rapidity with which the food is digested. The United States Department of Agriculture has found 500 mosquitoes in the stomach of one nighthawk. An examination was made of the stomach contents of a red-shafted flicker, and there were found 5000 ants which had been eaten at one meal. One hundred whole beetles have been taken from the stomach of a cliff swallow. I have taken 66 large cutworms and 16 beetles from the stomach of a meadow lark and out of still another one 44 beetles. One hundred and ninety-

*Forbush, E. H. 1921, The utility of birds. Dept. of Agri. Commonwealth of Mass. Dept. Bull. No. 9.

two cutworms were taken from one robin's stomach, a bird secured in Inyo County. Turning to weed-seed eating birds, we have even larger numbers. From the stomach and crop of one mourning dove have been taken 7500 weed seeds, from another 9200 weed seeds. This should be sufficient evidence that birds do need large quantities of food.

Birds also have very rapid digestion. By feeding captive birds known quantities of food and then examining their digestive tracts after a lapse of time, the rate of digestion can be ascertained. Experiments of this kind have shown that non-game birds digest a meal in from two to four hours. This means that one of these birds needs at least three meals each day. For instance, in estimating the food of the robin mentioned above, multiply the 192 cutworms eaten at one meal by three and we get some idea of the amount the robin might have eaten in a day. Not only is there a great capacity for food but there is also a rapid digestion of it.

Still more important is *the relation which birds have to an insect outbreak.* Insects are not necessarily always injurious until they appear in abnormal numbers. If it can be proved that birds eat the insect most abundant then they play an important role at the time of an insect outbreak. Now we have considerable evidence that birds act as a police force or as a standing army; ready to move across country to where insects are most numerous. Forbes* in Illinois studied very carefully the food habits of birds in an orchard where cankerworms were abundant. Observations were carried on in two orchards, one where cankerworms were abundant and the other where they were present in fewer numbers. Results showed that birds in the orchard where the cankerworms were numerous, were taking a much larger percentage of cankerworms than in the orchard where worms were not so numerous.

Many years ago a university professor in Nebraska investigated the relation of birds to the periodic outbreaks of the Rocky Mountain locust. He found that practically every kind of a bird, from one of the size of a hummingbird to one the size of a pelican, fed upon these insects when they became abundant.

Here is evidence from our own state. In 1911 near Mt. Shasta there appeared a plague of caterpillars, black hairy caterpillars that feed on *Ceanothus.* They gave much trouble by defoliating brush and polluting the water supply of several towns. Still later of course there followed myriads of butterflies. Butterflies were so abundant that hundreds could be counted inside one square foot on moist ground where they gathered to drink. Now as a rule birds do not eat butterflies. They do not seem to like butterflies although we do not know just why. However, an investigation showed that five California birds had turned their attention from their usual food and were feeding largely upon these butterflies, brewer blackbirds, western kingbirds, and meadow larks taking the larger number.

Periodically there is an outbreak of grasshoppers in some portion of our great valleys. A census was taken of the number of birds in a region so infested which showed that birds were unusually abundant. A census taken in another part of Merced County, similar in character but where grasshoppers were not so abundant, showed that the birds

*Forbes, S. A. 1885. The regulative action of birds upon insect oscillations. Ill. State Lab. Nat. Hist. Bull. 1.

had actually moved across country to where the insect food was most abundant and most easily obtained.

Everything points to the fact that birds actually turn their attention to the insect most available and in so doing they must bear an important relation to the control of an insect outbreak. We do not know how many outbreaks may have been stopped by birds before the insects became apparent. Of course we can not depend upon the birds alone for stopping insect outbreaks, but certainly we should consider them an important natural method of control.

Birds may have a relation to weed control. Many plants are very prolific. They produce thousands and sometimes hundreds of thousands of seed annually. Here again plants would very easily take the earth if certain control measures were not to be found in nature. By stomach examination it has been found that one dove had eaten 9200 weed seeds for a single meal. Many states are wondering if the dove is not more important as a weed destroyer than as a game bird. The goldfinch prefers seeds of dandelion and sunflower, cosmos, etc. In captivity they appear to need seeds of this sort. Some birds in taking

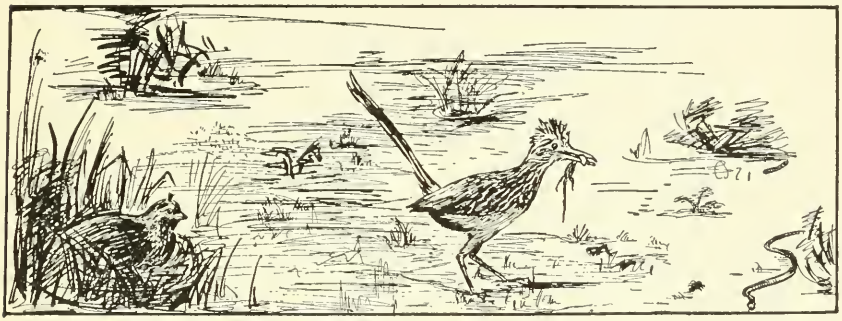

FIG. 4. The roadrunner, often accused of destroying the eggs of quail, feeds largely on insects, mice, lizards and small snakes. Judging from many examinations of stomach contents it must be only an occasional individual that destroys nests and eggs of other birds.

certain kinds of seeds become seed distributors. Occasionally they may help to spread plants we do not wish distributed. For instance, the red-shafted flicker sometimes eats the seeds of the poison oak. These seeds are not digested but are sometimes carried many miles away. Thus, this bird may really play an important part in seed distribution.

The most evident good accomplished by birds is the destruction of rodents. Hawks and owls are considered our best rodent destroyers. Some men are willing to pay their boys ten to twenty-five cents for every gopher captured. A pair of barn owls have been known to capture ten gophers in a single night and carry them to their young. Most of the hawks and all of the owls are extremely beneficial because they destroy the very things that we wish to have destroyed. The marsh hawk is an excellent mouser, likewise, the roadrunner, although he feeds largely on lizards and snakes. From the stomach of a great blue heron I have taken two large pocket gophers. Most readers are aware of the good work of this bird in alfalfa fields.

Game birds have a very evident food value but although this may be emphasized, their part in insect and plant control could likewise be demonstrated.

To balance the harm against the good accomplished by each kind of bird becomes the duty of every complainant of the depredations of birds, for quick judgment seldom leads to the truth about a bird's food habits. Furthermore public sentiment supports both federal and state laws giving protection to all insectivorous species.

It is hoped that the economic value of common birds has been convincingly presented by showing their relation to insect and rodent control. The good accomplished is the more evident because of adaptations for catching, large capacity, rapid digestion and habit of taking insects most abundant. Realization of the part played by birds should be common knowledge to both old and young so that natural resources may be better appreciated and protected.

Fig. 5. Ring-neck pheasant, a famous game bird now being propagated at California's new game farm at Yountville, Napa County.

CALIFORNIA'S NEW STATE GAME FARM.

By Harold C. Bryant.

The California Fish and Game Commission and the sportsmen of the state are planning to place California in line with other states in game propagation. Few states have accomplished more in acclimatizing food and game fishes, but thus far little has been accomplished in the introduction of game. Believing that the time is ripe for concerted effort in the propagation and acclimitization of game birds, a pretentious program is planned.

A start was made last fall when 5600 young ring-necked pheasants were purchased in Washington and liberated in Inyo, San Diego and

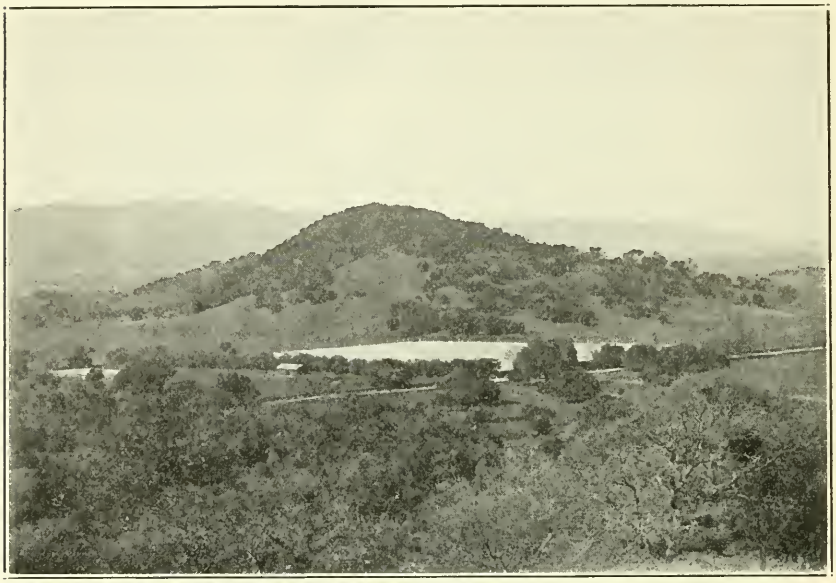

Fig. 6. Rearing pens at the new State Game Farm at Yountville, Napa County. An area of 7½ acres is under cover and there are 472 pens.

Stanislaus counties. Favorable reports have been obtained of these introductions.

Before another month is past, California will own one of the largest and best equipped game farms on the Pacific coast. For several months past a visit would have shown a scene of great activity. More than twenty men were employed: carpenters busy with the storeroom, others erecting fences and plumbers installing water pipes.

In order that no mistake might be made as to the site the Commission secured the expert advice of Mr. Gene M. Simpson, Superintendent of the Oregon game farms. On looking over several suggested sites, one on the state-owned farm at Yountville, Napa County, was selected. Soil and climatic conditions are ideal. Situated in the foothills near typical quail country, fifty acres have been appropriated for use. The main enclosure includes about seven and one-third acres. This area is surrounded with a vermin-proof fence placed on a cement footing and is

completely roofed with wire. There will be 472 pens, 24 by 24 feet. The famous Pendleton farm in Oregon has but 324 pens. Driveways for the feed wagon and a complete watering system will be provided. By a system of runways it will be possible to move birds from one pen to another without catching them. Homes for the superintendent and help are to be built.

In that fifty acres have been set aside for the use of the farm, there will be adequate fields for portable pens and for the growing of food plants.

Recent successes in game farming have largely been due to efforts to simulate natural conditions within the rearing pens. Formerly birds were reared in an open pen containing no growing food and no cover. At the Yountville game farm no expense has been spared to furnish

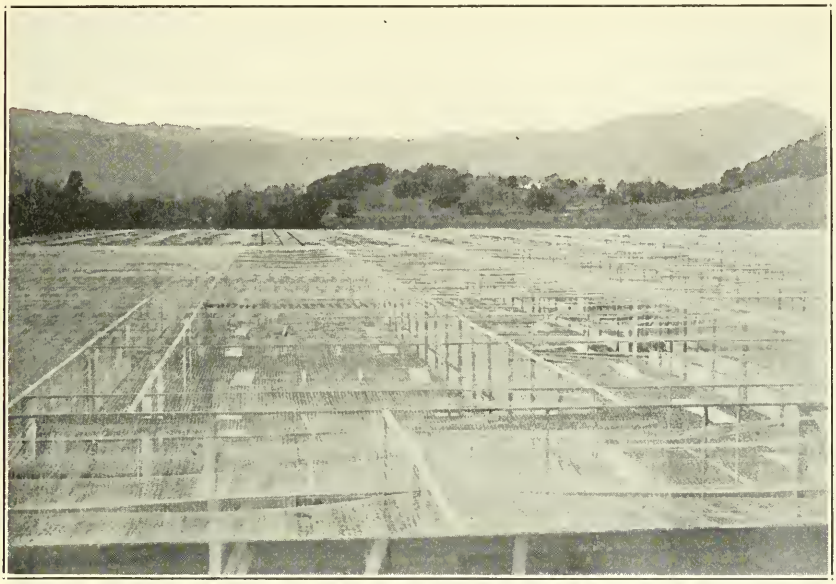

FIG. 7. The rearing pens at the new game farm at Yountville showing the arrangement of the pens.

growing food in every rearing pen. A sprinkler system has been installed which will keep alfalfa, kale and other plants watered and growing. Every pen will have moist conditions in half of it and dry conditions in the other half. The growing food plants give the birds shelter and teach them to forage so that if they are planted in the wild they know how to find food. Another advantage with growing plants within each pen is that plant life attracts insect life and pheasants must have some insect life in order to thrive.

Already shipments of pheasants have arrived, and before the laying season begins the pens will be ready. The choicest of breeding stock has been secured from Oregon and Washington. Hundreds of setting hens have been secured to hatch and mother the chicks. Where a few hundred birds were reared on the old Hayward game farm it is planned to rear thousands on this new farm.

The valley quail situation calls for action and plans are being made to propagate this native game bird in the hope of replenishing depleted game covers. British Columbia and Washington are boasting of the Hungarian partridge and attempts will be made to propagate this bird in sufficient numbers for stocking. Every effort will be made to furnish in large numbers all of the game birds suitable for acclimatization in the cultivated districts of the state where native game has disappeared.

Activities in connection with the propagation and introduction of game is vested in a Bureau of Game Farms. Mr. August Bade, a successful game farmer of Washington, has been retained to superintend the work. He is stationed at the Yountville farm and on him will rest the responsibility of a large annual output from the farm.

This new activity in game farming comes after nearly a ten-year

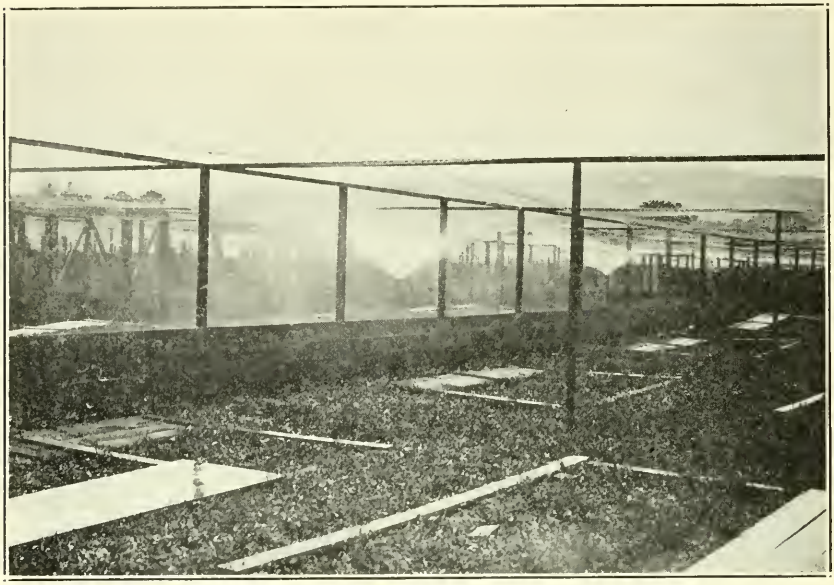

FIG. 8. A sprinkler system is to be utilized in watering the food plants to be placed in every pen. Half of each pen will furnish dry conditions, whereas the other half will be a mass of vegetable growth suitable for both food and cover.

period of lack of interest in this method of game conservation. From 1908 to 1916 numerous pheasants and quail were reared on a game farm at Hayward and distributed. Wild turkeys were also reared.

Previous to state endeavor along these lines, many private individuals had attempted propagation and introduction. Some of these ventures were attempted as early as 1893. A number of pheasants were purchased by the Fish and Game Commission in Oregon in 1894 and given wide distribution. In 1908 the commission purchased 3500 Hungarian partridges, some of which were used for breeders at the game farm. Other early attempts included the attempted introduction of the Chinese quail, bobwhite, Gambel quail and several species of Mexican quail. In all, more than a dozen species of game birds were introduced. In most instances these introductions were followed with optimistic reports

of success but, with the exception of the ring-neck pheasant, none of these birds established themselves.

Successes in Oregon, Washington and British Columbia give California sportsmen encouragement. If the state because of a long history of past attempts can now profit by its mistakes, time and energy will not be wasted and California will line up with other states that have been successful in establishing exotic game birds. Nothing in recent years has shown so earnest an attempt at improving hunting conditions as the move to propagate game birds in large numbers.

MONEY IN THE BANK.

By W. L. Scofield.

(Contribution No. 59. Department of Commercial Fisheries.)

We all know that the game and fish of this state belong to the people of California and most of us recognize that they are of great value from several points of view. However, some of us are not so aware of the fact that the marine fishes along our coast comprise a resource of the state that each year yields a return of millions of dollars.

The people of the state, as owners of these commercial fish, are in the position of the man who is notified that he has been left a large legacy, a sum of money on deposit in the bank, a sum upon which he can draw at will. His first question naturally is "How much money is there?" He is told that no one knows the amount of the legacy; no one knows how many fish are in the ocean and there is apparently no method of finding out. It is known only that the sum is large and that he can draw as much as he pleases. This man, being blessed with common sense, said "If the sum is very large, the interest each year must be large so I will adopt this policy: I will draw each year only the interest on this sum and leave the principal untouched so that I may continue to enjoy this legacy throughout my life and my children also may enjoy it." If he had been foolish he would have decided to squander it by overdrawing and have nothing left in the end, but instead, he decided on a policy of wise use, in other words he (the people) adopted the policy of conservation.

Most men, and some women, keep a record on the check book stubs of how much money they draw from a bank, and the particular man we are here considering decided to keep such a record. California was a pioneer in adopting a system of accurately recording the catch of fish in the state, and our triplicate receipt or "pink ticket" system is the foundation for our knowledge of commercial fishes.

Our man, having decided to draw only interest and leave the principal intact, is next confronted with the outstanding all-important question of "How much may I draw each year?" Since the total sum is not known, the exact annual interest can not be computed before drawing from the bank. There is left but one thing for him to do, that is, draw some money, and, when he thinks he is overdrawing, cut down on the sums drawn. This is the trial and error method necessary when exact calculations are not possible. But how can he know when he is overdrawing? An off-hand examination of the sum drawn from the bank does not tell him whether this money is just interest or is part interest and part principal. He might go on for years digging

into the principal and not know it or he might draw each year a sum far less than the annual interest and be unaware of his lost opportunity to enjoy the full amount of the interest.

This sensible man decided to invest a small portion of the money drawn in hiring an expert in such matters to tell him whether or not he was overdrawing his quota of interest money at the bank. In this way there was established in California a research branch of the Commercial Fisheries Department of the Fish and Game Commission. Our man with the legacy rightfully expects eventually to get value received on the money so invested in research. It is the purpose and the duty of this department of research in commercial fisheries of California to give to the man with the money in the bank the answer to the question most important to him—"How much may I safely draw each year?"

The carefully considered program of research adopted by the State Fisheries Laboratory is directed toward answering the one most important question of how much can be drawn each year without digging into the principal. Stated in other words—when is overfishing occurring? Strange as it may seem, this question has been given very little consideration in the past, so there is no accumulation of knowledge on the subject resulting from work done elsewhere, and it has been necessary to start with an almost clean slate. At another time we hope to discuss with readers of CALIFORNIA FISH AND GAME the methods used in arriving at an answer and to present something of the difficulties and complications met with in trying to answer the question; but here we are interested in defining the question to be answered. It seems that we all do better when we first determine just what we are going to explain before we start explaining anything, and in fisheries research it is desirable to understand where we are going before we start anywhere and before we decide on the route to be followed.

The man with the money in the bank is not overly interested in the why of things, he wants to know what amount of interest can be drawn. Applied to any one particular fishery we must first find out what is happening in that fishery before trying to explain why it is occurring or might occur. The complete answer to the question of overfishing will undoubtedly involve the reasons for occurrences, but the chief question is one of *what*, not *why*. In this particular fishery, is the commercial catch greater than it should be or less than it might be with safety?

Should we study the life history of a certain fish, its spawning habits, its food, its migrations and the ocean currents or temperatures that might govern its movements? Perhaps so if we can see where such questions will tie in with the goal at which we wish to arrive; that is, the determination of overfishing. The above questions are big ones and there is very little known about them to start with, so the road toward answering them will be long and rocky; but that need not frighten us if the road leads to our goal. There is a more certain and possibly more direct route that gives much promise of leading us toward determining overfishing. An examination of the commercial catch itself gives promise of answering the question we want answered. The two methods for examination of the catch to determine overfishing

have been discussed elsewhere, so need only be mentioned here as studies of boat catches from year to year and changes in the normal proportion of age or size classes in the catch from year to year. We expect such studies to answer directly the question of overfishing and to determine at what point the money drawn from the bank ceases to be interest and begins encroaching on the principal. We do not expect the answer to be quickly and easily forthcoming, for unfortunately we have found this road also to be long and rocky. The full understanding of the catch may involve most if not all of the difficult questions as to life history and habits of the fish, but of themselves they do not promise much in the way of a direct answer to the most important question of how much money our man should draw from the bank each year.

The commercial catch is by no means a simple thing and the supply of fish is subject to natural fluctuations. If the legacy in the bank is in the form of common stock of a somewhat unstable or seasonable industry, the value of the legacy fluctuates and the interest rate is changeable so that our man will no doubt have to figure his interest as averages over a period of years. Suppose this money is common stock of a cotton mills company. To foretell possible future fluctuations, our man may wish to know about cotton milling, sale of goods, or even purchase and production of raw cotton, provided he is unable to learn about these fluctuations from a direct examination of the amounts he is drawing from the bank each year. But after all, what does the man receiving the legacy care about cotton? If he is interested at all, he will wish to know about cotton only as it affects the amount of interest he is able to draw from the bank.

The owner of the cotton stocks has hired an expert for the one primary purpose of distinguishing between interest and principal in the money drawn from the bank. Should this expert study cotton? If he goes in for an exhaustive study of cotton, will he be in a position to answer the question the owner of the cotton stock is asking him? It would appear that the expert might better start with an examination of the money drawn from the bank, since it gives promise of solving directly the primary question.

By some such line of reasoning, the staff of the State Fisheries Laboratory decided to first examine the commercial catch to find out what was happening there before becoming involved in questions of why something happened. The laboratory staff conceives its chief duty to be the examination of the commercial catch to determine whether or not overfishing is now occurring. This involves a study of the catch to learn the signs by which overfishing manifests itself. These signs were not known. In fact, very little is known about overfishing and there is no store of information to draw upon, so we are having to find out for ourselves and incidentally blaze a trail that should help others as well as ourselves later on in the study of other fisheries. We are limited as to staff and funds, so have concentrated on the two most important commercial fisheries of the state, sardine and albacore. We are earnestly striving toward the answer to the chief question and already have learned a number of valuable things about the catch and what may be expected of it. We hope to show the man with the money in the bank that his judgment was sound when he

decided to venture a small investment in research to determine essential facts rather than going it blind and trusting to luck.

Transmitted November, 1925, San Pedro, California.

PURSE SEINES FOR CALIFORNIA SARDINES.

By W. L. Scofield.

(Contribution No. 58. Department of Commercial Fisheries.)

In the first years of sardine canning in California the only net that could be depended on to take large quantities of fish was the purse seine, but this gear fell into disrepute and for ten years was classed as obsolete while another type of net was universally adopted. Within the last few months there are indications that the discarded purse seine is staging a comeback and may again dominate sardine fishing in this state.

The first catches of California sardines in sufficient quantities to be considered commercial catches were made in gill nets, that is nets with a mesh of such size that the sardine could push his head into an opening in the net, but in backing out would catch his gill covers in the webbing and thus become entangled. Gill nets are still used occasionally for sardines, but the catch is very small and this method of fishing is employed only for supplying a small local fresh fish market or for catching sardines to be used as bait for some other fish.

When sardine canneries were established* in California it was found that gill nets could not supply the plants and it became necessary to employ the purse seine. This net is of small mesh but is very long so that it can be laid out in a circle around a school of fish, the webbing hanging like a curtain about the school. A strong line run through rings at the bottom may be pulled to close the net at the bottom, thus trapping the fish in the pocket or purse formed by the net. This type of fishing gear enabled fishermen to capture enough sardines to keep the small capacity canneries of the early days supplied with fish part of the time, but the catch was uncertain, was fluctuating in amount and frequently failed when fish were most needed at the cannery.

There were several reasons why the purse seine of early days failed to yield a steady supply of fish. In the first place the fishermen were not familiar with the habits and movements of the sardine. Schools were located by seeing fish jump at the surface or by seeing the fish in shallow water in the day time, and fishing at first was confined to the daylight hours. Later it was discovered that sardines could best be located at night by the phosphorescent light resulting from their movements in the water, and as a result daylight fishing was gradually abandoned, especially at Monterey. The early purse seines were circled by hand from skiffs and pulled by hand, with the result that the "lay-out" and "pursing" were delayed and the hand work required a crew of ten to twelve men, thus running up costs of operation. Another reason for early failure, at Monterey at least, was the fact that gear

* The Golden Gate Packing Company built the first California sardine cannery in 1890 at North Beach, San Francisco, but about two years later the equipment was shipped to the newly established Southern California Fish Company at East San Pedro, where canning was begun in 1892. At Monterey, Mr. F. E. Booth started packing sardines in 1902 and built a cannery in 1903 under the name of Monterey Canning Company.

(net and boats) was furnished by the cannery, and fishermen were paid wages by the month so there was small inducement to scout for fish or to acquire the knowledge necessary for success in a new fishery. Most of the early purse seining (before 1905) was confined to shallow water, because in deep water the sardines were almost sure to be frightened and duck under the lead line before the net could be "pursed" by hand. During most of the year sardines were not to be found in shallow water in the daytime.

In spite of the crudities in the purse seine method of fishing, this net furnished all the sardines used by the canneries up to 1905, and its use was continued till 1915 at least and possibly a year or two later. There were improvements in the construction of the net, but the greatest advance made in method of fishing was the use of a power boat in "laying out" and a power winch to purse the net. This cut down operating time and the net was more and more used in deep water so that the purse seine became more successful in later years, but it failed to hold its own in competition with a new type of Mediterranean net introduced into California from Algeria on the north African coast.

The great drawback of the old style purse seine, aside from cost of operation, was the fact that slow pursing allowed sardines to "dive" under the lead line. Petro Ferrante, an experienced and inventive Monterey fisherman, suggested that the net called "lampara" used in the Mediterranean might solve the difficulty as it had a large bag into which the fish might be driven before they "dived." Accordingly in 1905 Mr. F. E. Booth sent to Tangier and purchased one of these nets which promptly tore to pieces the first time it was used, but from it, as a model, other "lamparas" were constructed and used at Monterey. They were successful from the first and revolutionized sardine fishing in California. The lampara was soon adopted in Southern California as it yielded a greater and more continuous catch and was cheaper of operation. A crew of nine men with a lampara could do the work of ten or twelve men with a purse seine However, the discovery of night fishing and increased skill and knowledge were contributing factors to the success of the lampara and the purse seine continued in use for day fishing until 1915 or later, but the purse net was steadily being supplanted by the new type of gear.

The lampara is a highly specialized net with long wings of very large mesh serving to frighten the fish into the large bag of small mesh. The large mesh permits of the lead line being pulled rapidly so that it partially closes the bottom of the net, but the action of the net in the water is somewhat that of a scoop such as used by grocers with the small mesh bag holding the catch.

The lampara was used in addition to the purse seine equipment for the ten years following 1905, and for the next ten years (1915–1925) it was the only net used for sardines with the exception of the Japanese round haul net which is merely a modification of the lampara and is operated in the same manner and is built on the same plan as the Mediterranean net. The "round haul" net of southern California is almost identical with the lampara used at Monterey.

The purse seine although crowded out of the sardine fishery by the lampara was by no means forgotten, and by 1915 was being used in the catching of barracuda, white sea bass, yellowtail and mackerel in

southern California.* Later this net was used for tuna, and by 1920 the estimated number of purse seine boats operating was placed at 100. It soon became evident that there were too many boats so engaged and many of these fishermen have been forced into other lines of work.

In January of 1925 the owner of one purse seine boat at San Pedro procured one of the old small mesh purse seines and decided to again try out this old time gear on sardines. He met with success and by the middle of November, 1925, there were 25 purse seines employed regularly in the sardine fishery of San Pedro. Other such nets are being ordered and the purse seiners feel confident that the worm has turned. They think the dethroned purse seine will drive out the lampara and in a short time will again dominate sardine fishing in this state.

The reasons given for the return of the purse seine are many and somewhat contradictory. The purse seiners claim that this net is proving more successful than the lampara or round haul and that they get larger catches with less effort. The purse seine is credited at San Pedro with being superior on nights of rough weather, in fog and when sardines are active or "wild." It is claimed that power hauling of the net is quicker, cheaper and more successful in catching fish than the hand pulled lampara. It is possible that purse seiners forced out of other fisheries are of necessity turning to sardines to save their investments in boats. It is also possible that the skill and general experience gained in purse seining for other species is proving so valuable that the purse net is actually more successful now than other types of gear. Many of the present purse seiners have also had round haul experience in the sardine fishery so are more familiar with the sardine than the early purse seiners. This much is certain, the large purse seine boat with its deep hold will carry a larger tonnage of fish than the round haul launches used at present in San Pedro. These launches carry the catch on deck by using side boards, whereas the Monterey fishermen employ lighters or barges for transportating the catch. Lighter capacity can be increased indefinitely. Round haul fishermen give as their reason for carrying the catch on deck that, in the warmer water of southern California, fish piled deep in a lighter would be unfit for canning. The southern fishermen are handicapped by having to go farther to the fishing grounds, so that transporting the catch on the deck of the launch is easier than towing a lighter. Purse seiners claim that fish from the deep hold of their boats is uninjured for canning purposes and the cannery managers agree to the extent of willingly accepting purse seine fish.

The apparent success of the purse seine in competition with the round haul nets of San Pedro may be due to the real worth of the purse seine gear, but it is possible that success is due more to the respective fishermen than to the kind of gear used. Aside from the purse seiners, there are very few white men engaged in fishing sardines at San Pedro. Most of the round haul crews are Japanese with little knowledge of navigation and lacking in all-around fishing experience. This might possibly explain the partial failure of the round haul net, especially in foggy and rough weather. The relative merits of the

* Fish Bulletin No. 9 of "California Fish and Game Commission." Preliminary Investigation of the Purse Seine Industry of Southern California, by Tage Skogsberg. See page 9.

two types of gear could well be tried out at Monterey where the Italian lampara fishermen have had years of experience in catching sardines.

The purse seines now being used at San Pedro are not, of course, the same nets as used in the tuna fishery, but are smaller special nets made with small mesh for sardines. The present sardine purse nets are, roughly, 200 fathoms long by about 20 fathoms deep with a mesh size of 1 or 1¼ inches. Webbing is usually tarred. The net is hauled by power winch, and dipping into the boat or brailing is usually by power hoist from a boom.

On the southeastern coast of the United States the purse seine is the standard gear for capturing the thousands of tons of menhaden that are caught for the purpose of reduction into fish meal and oil. The large capacity boats employed are efficient for handling fish intended for reduction, but such methods are poorly adapted to handling fish intended for canning. It is, however, possible to handle edible fish in large boats by the use of special methods, such as freezing or by chilling as is now being tried out in the menhaden industry. Another possibility is the so-called "unit system" in which fish are loaded into small units as boxes or baskets which can be stacked without crushing the fish. The added cost of such protective measures may more than offset the advantages of quantity transportation when applied to the present fishing conditions in the California sardine industry. Chilling methods may develop as a means of tiding over days of poor catch rather than as economy in transportation. At any rate purse seining seems to be a method adapted to quantity handling and long distance transportation, while sardine fishing in California is conducted at short distances from the canneries, so there is less advantage in each boat handling a large tonnage. Cheapness of operation will probably decide whether the round haul or the purse seine will finally win in the present competition at San Pedro. Whichever gear proves to be most successful, the battle will be watched with considerable interest.

Transmitted November, 1925, San Pedro, California.

BARGE FISHING ON THE SOUTHERN CALIFORNIA COAST.

By Wm. C. Van Deventer.

For many years the people who wished to fish in salt water had only three methods from which to choose. They had to have a boat, fish from a pier or fish from a beach. All of these methods had their drawbacks. The boat method was more or less limited to those who owned or were willing to pay the price of renting a boat. Fishing from piers or from the beach is rather slow as the fish are scattered and usually run very small in size. About five years ago Mr. A. B. Hohenshell of Long Beach conceived the idea of a fishing barge. This idea combined many very desirable features not found in the other methods of fishing. First, it is movable and can be towed to a location where fish may be caught. Second, it is large enough so that several hundred people can be accommodated. Such a large number of people using it makes it possible for the owner to charge a low rate for the privilege of fishing. Thus such a barge makes it possible for nearly everyone to go fishing and be insured of a good catch. Since the first introduction of fishing barges along this coast a great number have sprung

into existence, and today about twenty are found along the coast from Santa Barbara to San Diego.

When fishing was first started from a barge, equipment was old and dirty. The first one had few accommodations on it, for the owner did not wish to risk any more money on the venture than was necessary. The idea was new and the risk great. However, from the start the venture proved a success. Today this man has a barge, *Paproca V,* that is fitted with all the conveniences that are found on any boat. The barge is decked with concrete and has a capacity of two hundred and fifty people. A lunch room, lounge room, toilets, sleeping quarters for the convenience of the fishermen are provided, as well as quarters for a crew of five men. The barge is lighted by an electric system and water to wash the deck is furnished from a pumping outfit.

Transportation to and from the barge is provided by two boats that make hourly trips during the day and a trip at ten in the evening. The best fishing ground is located about four miles southeast of the Long Beach pier and these boats make the trip in about twenty-five minutes.

Fish are caught at every hour of the day. Mackerel are caught in the largest number, but at times bass, barracuda, and occasionally bonita schools surround the barge and are caught in large numbers. If one wishes to fish on the bottom and uses the proper gear, halibut and an occasional black sea bass may be caught. To insure a constant supply of mackerel, the barge is located in a favorable locality. Then to keep the mackerel around the barge, chum is constantly thrown out. This method of chumming insures a good supply of mackerel at all times. The mackerel gear is furnished free and consists of a long bamboo pole, with line, leader, sinker and hook attached. Mackerel or anchovies are used chiefly for bait. At night lights are hung over the sides of the barge and schools of small sardines and anchovies are attracted by the lights. These small fish in turn attract the mackerel which feed on such small fishes, and the mackerel are easily caught in large numbers. The best time for fishing is in the dark of the moon. Some people prefer night fishing to the day method, but I believe that the best fishing is at dawn or dusk.

Barge fishing is an established institution among southern California fishermen and is constantly gaining more popularity. This statement may be further emphasized when one learns that the *Paproca* in its five years existence as a fish barge has handled over one hundred thousand pay customers and a countless number of deadheads of which no record has been kept.

HUNTING WITH ANIMAL BLINDS IN MERCED COUNTY.

By J. E. Newsome.

In the early seventies a man named Charley Smith who formerly hunted for the market in the tules below Stockton, left there and came to Merced County, locating near the Santa Rita ranch where he intended to hunt for the market. In watching the cattle feeding around the ducks and geese he conceived the idea of training an animal to use as a blind to approach ducks and geese. He was very successful in his undertaking and killed thousands of game birds which were taken to

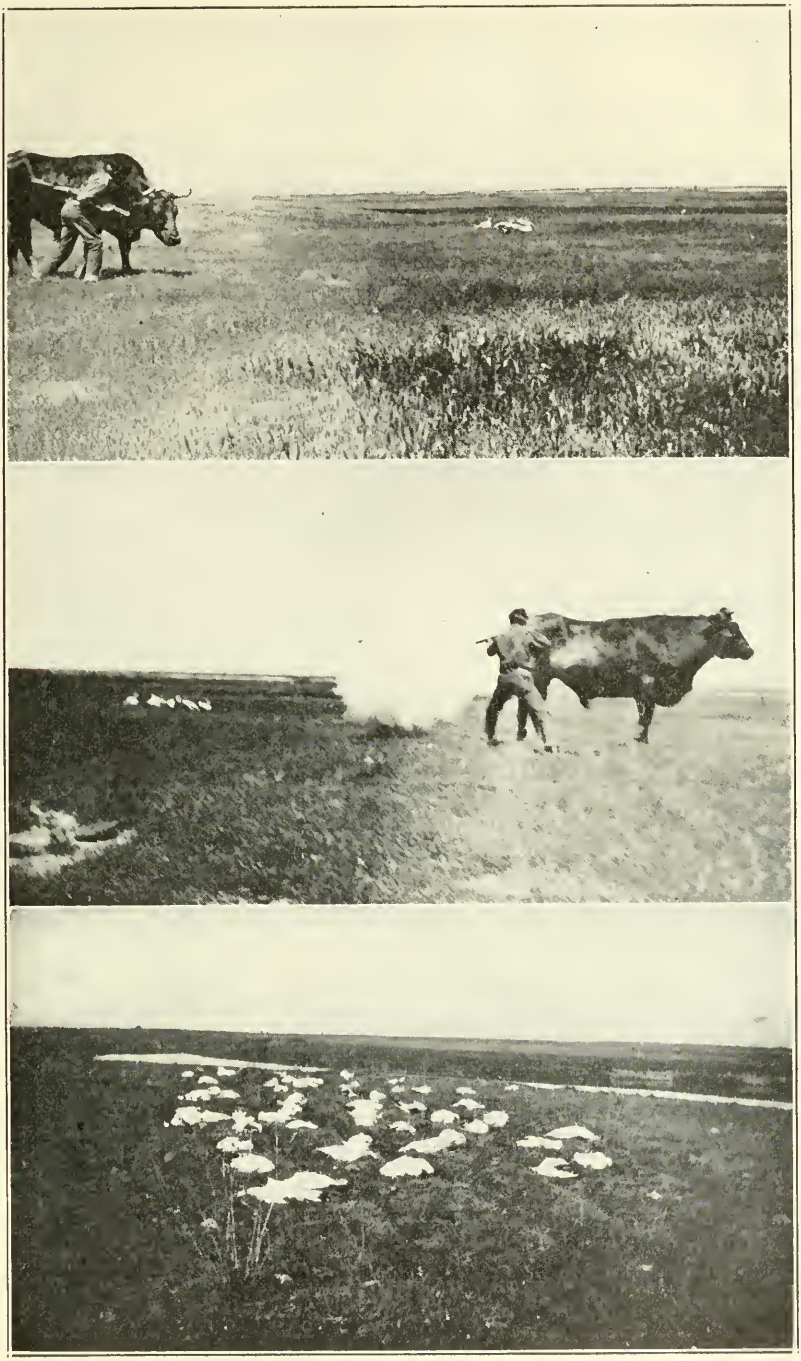

FIG. 9. Series of photographs showing a market hunter with an animal used as a blind; the approach, the shot, and the kill. More than a hundred birds were sometimes killed with the discharges from a large-bore gun before this type of slaughter was prohibited.

Merced and shipped to market. Miller and Lux hauled them to Merced free of charge to get rid of the birds as they were destroying a great quantity of feed. In those days they used large bore double-barrel guns as they did not have automatic and pump guns. Smith did not hunt many years. While there was an abundance of game the market was very poor and the express charges were high. Smith, no doubt, was the inventor of the live blind. Later he took his daughter Lillian Smith, who was a noted rifle shot, and traveled with Buffalo Bill's Wild West Show.

The next hunting with an animal blind was done by the Browning brothers. They hunted on the West Side in the Salt Slough country and had two large steers. A large negro worked one of them and they used large bore double-barrel guns. Their game had to be hauled to Merced as that was the nearest shipping point, there being no railroad on the west side. There were no bridges and the ferries were a long way apart. They had two scows, one on Salt Slough and one on the river near old Dover. The wagons were loaded on the scows and the horses swam the slough and river. Two wagons and teams were used and a load was taken to market every day as it required two days to make the trip. The largest shot they ever made was 184 ducks. They did not hunt very long as game was very cheap and it was quite an expense to get it to market.

There was not a great amount of hunting done for the market until the West Side railroad was built. Then there were several outfits in the fields all using large steers, the first being Knight & Jeffers, followed by John Reeves, James Knapp, Lambert, S. B. Roundtree, James Peterson, Ed Alders, Tom Rooney, Ed Lang, Saling and others. Lang used a single-barrel gun with a very large bore and all used steers as blinds. There were no horses used as blinds until after a law was passed to prohibit the use of a live animal blind. Then the horses came in style as they were too easily caught with a steer. When the old timers gave up the chase, the younger ones took it up with improved methods of slaughter. They used carts with three and four horses abreast and trained to run and automatic guns with extension magazines holding nine or eleven shells. Others had two automatics bolted together and the trigger connected so that they would both go at once, and with extension magazines holding nine shells each, making eighteen loads in all. After the law was passed prohibiting the use of guns with a larger bore than No. 10 there were a great many four-barrel guns used. Later the automatic came into use.

What became of our quail? In the years of 1876–77 and 78 Perry McDowell, Elisa Manning and S. B. Roundtree hunted quail for market in the West Side hills. In the season of 1878 the three men shipped 950 dozen, or 11,400 quail. In two days and a half, two of them killed 45 dozen, or 540 quail. They were shipped by stage to Gilroy, from there by train to San Francisco. There were other hunters who followed them and hunted quail until they were taken off the market.

CONDITIONS OF EXISTENCE OF FISH IN LAKE TAHOE AND TRIBUTARY STREAMS.

By G. A. Coleman, Biologist, California Fish and Game Commission.

The maintenance of a supply of game fish in Lake Tahoe, or any other lake, is not such a simple matter as most people imagine. Quite the contrary. Because of the great number of factors involved it is an intricate problem, requiring the most careful and extended observations and constant study.

We must first take into consideration the physical conditions, viz., the bottom, which is constantly changing, and next the temperature of the water, which, on account of the great depth, nearly sixteen hundred feet for an area covering nearly three-fourths of the lake, with a very steep decline and a very limited shallow shoreline, has a range of 20 degrees F. over the deeper part, and 20 degrees higher in the shallower parts near the shore where it reaches a temperature of 80 degrees F. during the summer. The temperature directly affects the density of the water, the summer sun warming the surface waters and causing them to become so much lighter than the deeper colder waters that the currents set up by the wind can no longer flow to the bottom. Hence a superficial circulation is set up and a distinct thermocline is established above which the water is warm (40–60 degrees F.) and constantly aerated, while below this the temperature is comparatively constant (39–39.9 degrees F.), but stagnant. This area of constant circulation is comparatively shallow, extending to a depth of about 100 meters while the area of constant temperature and no circulation occupies a depth of about 400 meters.

The amount of dissolved oxygen in the water upon which the fish are dependent for their supply is directly affected by these zones of circulation and stagnation, due to temperature. According to studies made by the United States Bureau of Fisheries during the month of July, 1913, the point of complete saturation (100 per cent) is reached at about 25 meters, from which point it declines rapidly to 100 meters where it reaches 89 per cent, below which it remains fairly constant, reaching 88.4 degrees at 501 meters (near the bottom). A little study will show that this agrees almost exactly with the temperature zones. Now these temperature zones are destroyed at the coming on of winter by the lowering of the surface temperature, and a complete circulation is set up during the winter and early spring.

Since all fish are extremely sensitive to changes of temperature (being affected by as small as .2 degrees F.) as well as by the supply of dissolved oxygen in the water, it is reasonable to account for the movements of the trout in the lake upon this basis.

All fish, but especially the Salmonidæ, which includes the salmon and the trout, migrate for two principal reasons, to obtain a proper food supply and for the purpose of securing suitable spawning ground. The first of these movements is daily and periodical according to the movements of their food, while the second is seasonal, occurring either in the fall or spring according to the habits of the fish.

With the native lake trout, which is primarily a deep water trout, the change of temperature gives them notice that spring is arriving, their first response being an immediate quest of food to relieve the

long fast which they have had in deep water, during which they have existed upon the accumulation of fat obtained during the previous season. The several species of minnows in the lake are their natural food, hence they immediately move to the haunts of the minnows which are the comparatively shallow waters along shore. They are ravenously hungry, and their condition at this time and at the spawning time immediately following will therefore largely depend upon the supply of minnows.

The minnows feed upon aquatic insects, both larvæ and adults, with a small proportion of plankton (microscopical plant and animal life) in the water. These in turn are dependent upon the algæ growing in the shallow waters along shore, except for certain minute algæ, crustacean and protozoan forms which live and breed in the open waters.

It is necessary also to have an adequate supply of the larger rooted aquatic plants in these shallow waters in order to furnish food and protection for the aquatic insects and protection for the young fish of whatever variety.

This aquatic vegetation depends in its turn upon a proper supply of nitrates in the water and soil. This is usually lacking in a mineral soil and can only be produced in a marly or vegetable soil by certain nitrogen-fixing bacteria which take the nitrogen from the air and water and work it over into a form suitable for absorption by the growing plant tissue. The process of decay is also constantly going on, giving off immense quantities of carbon dioxide which is absorbed and held in suspension by the water, where, if in any considerable quantities, it becomes a menace to the fish life. The growing plants take up this excess carbon dioxide, using it in starch building in connection with chlorophyll.

So we might go on almost indefinitely, because there is an almost endless connection and dependence between the plant and animal forms of this vast water community. With an idea of obtaining some clue to this intricate puzzle—game of life—which is far more complicated than any cross-word puzzle ever invented—biologists have made extensive and quantitative studies of the larger lakes throughout the world, as to the composition and abundance of the plankton (microscopical animal and plant life). This has been determined by a method of counting the organisms in an average sample of the water at different depths and expressed in numbers per cubic centimeters, or in cubic centimeters per cubic meters, or in my own studies, where possible, by weight in actual dried food material per cubic foot of water as grams per cubic foot, which may be figured as pounds in any given area according to conditions and depth. This to my mind is the only practical economic basis upon which we can base a reliable estimate of the number of young and mature fish that a lake will support. It gives us, too, the basis for comparison of one lake with another, while the composition of the plankton gives us the key to the problem of what species of fish will do best in any lake or stream. But of course all the existing conditions must be taken into consideration before an intelligent system of distribution can be adopted.

In consideration of the causes for the former abundant and now intermittent supply of the native lake trout (*Salmo henshawi*), we

must remember that vast geological changes have taken place within the life of this species. Many hundreds of years ago (comparatively recent as to geological time) there existed just across in Nevada a wonderful lake which is known to geologists as Lake Lahontan, covering an area equal to if not greater than Lake Superior, with which Lake Tahoe was connected by the Truckee River and Honey Lake. Eagle Lake and others were also directly connected. Evidence is abundant that the species which was named the Tahoe trout was at that time the characteristic trout of this great lake system. Now, however, lakes Pyramid and Winnemucca, which have become very much changed as to the composition of the water and physical conditions, are all that remain of this great lake. Formerly there was direct connection between Tahoe and this great lake through which the trout could pass freely. But you know what has happened within the past few years, all of which has had its effect upon the supply of lake trout and upon the other trout associated with it.

The silver trout, for example, is now very rare in Tahoe, while a related, if not identical, species is almost extinct in Pyramid and Winnemucca. The white fish too is apparently becoming scarce. In all this great array of changes it would not be possible to put one's finger on any one and say that it alone is the cause of the scarcity or disappearance of any one of these species of fish. They have all contributed. To say, therefore, that the trouble has been caused by the introduction of Mackinaw trout is utterly absurd. Probably they have contributed a small share, but the change would have occurred without them, and we have the Mackinaw which still furnishes a considerable amount of sport and is a very good fish.

Probably one great factor is the shifting and destruction of the food supply. Mother Nature usually maintains a perfect balance between her different species of plant and animal life, but occasionally she gives them a general shaking up, probably on the theory that they need it in order to develop new species and to put new life in the old. So she sends floods, drouths or other cataclysms which disturb the balance for a time until the different forms become adapted to the new conditions.

Man himself, this lord of creation of which we are so proud, is probably the greatest disturber of this balance of all the forces of nature. To satisfy necessities or imaginary necessities, for pleasure, or out of pure deviltry, he has created a list of wants which would make those of any ordinary animal, content with mere existence, pale into insignificance. In order to create for himself a suitable habitation he destroys entire forests. In order to clothe himself in fine raiment, he sacrifices herds of domestic animals. But these are not sufficient. He must, in pursuit of fur and feather, accomplish the destruction of vast numbers of wild animals and the complete extinction of not a few species. To satiate his ever increasing appetite and satisfy his changing tastes, vast herds and flocks of domestic animals and fowls are daily butchered and the products of garden, orchard and fields consumed. The immense supply of fish food in our vast oceans is neglected, and in order to satisfy this so-called sporting instinct the comparatively small numbers of edible fish in our mountain streams and lakes are ruthlessly destroyed. Surely it is true that we as a

nation, on account of our great abundance of all these things, have become the most careless and wasteful nation on the face of the earth. (For instance, on a hotel menu of 1850 there were indicated fifty kinds of meat, mostly game and fish.)

It is full time, therefore, that we call a halt, take account of stock and learn whither we are drifting. Otherwise, we are in sad danger of having handed out to us the same fate which we have so freely handed out to our fellow creatures. A few far-seeing individuals, realizing what this wanton destruction would mean, have been able by persistent and heroic effort, often at great personal sacrifice, to cause laws to be enacted for the protection of our wild life and to create game refuges in which our wild animals might have protection in the breeding season. If you do not believe that the wild animals and birds appreciate and recognize the establishment of these refuges, you have only to spend a few quiet weeks within the borders of a newly created one and watch them flock in from without the borders.

Finally it came to be recognized that with all these precautions the production could not keep pace with the annual destruction wrought by our ever-increasing population, both native and tourist, in their annual migrations to the mountains, without the help of artificial means of propagation. Hence the establishment of fish hatcheries to keep up a supply of fish in our lakes and streams and the establishment of game farms has become a necessity.

All this, however, is not enough. We must immediately take steps to secure the cooperation of the tourists, campers and sojourners at our resorts, in the proper use, *and not abuse* of the privileges they annually enjoy amidst the grandest scenery and greatest variety of climate of any part of the world. Protective laws and their enforcement are all right, perhaps, as a restraint, but they are only incidental. Control to be reasonable must be flexible. The trouble is we have too many laws which are not enforced and too little knowledge on the part of the general public as to the *why* of these laws, with a consequent disrespect and disregard for all law and law enforcement officials.

In my personal contact with all kinds of people, I have yet to find the individual whose innate love for nature would not in some way manifest itself, through his own knowledge obtained by first-hand observations, by a desire to obtain information on the habits of our wild creatures through reading, or listening to the observations of others. Children are the most eager for this knowledge, and thanks to our loyal and progressive teachers in our public schools, they are obtaining this information through daily lessons, in every grade from the kindergarten up, in nature studies supplemented by their own observations, at home and on the way to and from school. Along with this knowledge comes respect for and tender care of every living thing, and especially of the wild animal and plant life. Fish habits are taught through daily care of goldfish in the schoolroom by the children themselves, with an occasional visit to a large aquarium, supplemented by fishing trips mostly by the boys. The work of scout masters along this line is strongly to be commended. This work will have its effect upon the rising generation.

Meantime we have old sinners like ourselves to contend with. And this is truly a herculean task. We need for this work the hearty coop-

eration of every resort owner, proprietor or manager, all of the various United States government agencies, especially the forest service and reclamation service, all of the state departments, all of the corporate lumber and hydro power plant interests, our own legislature and governor, and the press. With this cooperation all along the line, we can in a few years accomplish much toward the restoration of our wild life. But such is the task that even with all these agencies working in perfect harmony, it will take years to restore anything like the original condition of things existing only a comparatively few years ago.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

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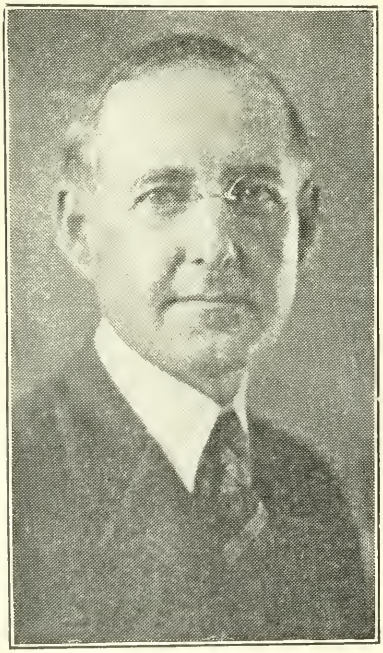
All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

July 6, 1926.

"The best insurance that the state can take out in the interest of the sportsman and the outdoor lover generally is to see that facilities for study and investigation are enlarged upon. The lack of biological data is, without doubt, one of the greatest single factors in retarding development of a larger conservation program, involving better and wiser legislation and greater efficiency in production."



R. H. Clock

RALPH H. CLOCK, FISH AND GAME COMMISSIONER.

In December, 1925, Governor Richardson appointed Judge Ralph H. Clock of Long Beach as Fish and Game Commissioner to succeed Frank M. Newbert. Judge Clock for many years practiced law at Long Beach, California, was then appointed a superior judge for Los Angeles County. After a short period of service upon the bench he resigned to again resume his private practice.

Judge Clock is an outdoor man, loves the open and is intensely interested in fish and game. He is an ardent angler and an enthusiastic sportsman. In fact, he is exceptionally well qualified to have a part in determining conservation policies in this state.

FISH AND GAME COMMISSION REORGANIZED.

At a meeting of the State Board of Fish and Game Commissioners held in San Francisco on January 18th, the resignations of Mr. George Neale, executive officer, and of Mr. Charles Gilmore, assistant executive officer and attorney, were accepted. Mr. B. D. Marx Greene, who for nearly a year has handled the legal work for the Commercial Fisheries Department, was selected as executive officer. Mr. J. S. Hunter, in charge of the San Francisco office, was appointed head of a new law enforcement department, and he will have entire charge of all of the patrol force in the state. This last appointment is the beginning of a plan to center the activities of the commission in various departments headed by competent executives.

Far greater efficiency in the management of fish and game affairs is to be expected from the reorganization planned by the commission newly appointed by Governor Richardson.

THE NEW EXECUTIVE OFFICER.

The new executive officer, Mr. B. D. Marx Greene, is a native Californian, born in San Francisco. He has been a practicing attorney in California for the past eighteen years, part of which time he served as city attorney of Berkeley, and was for twelve years city attorney of Pittsburg and Antioch in Contra Costa County. For several years, commencing in 1918, he specialized in rate proceedings before the California Railroad Commission, being retained by over fifty cities and counties in northern California to act as their counsel in electric, gas and transportation cases. In August, 1924, he was retained by the Fish and Game Commission as special counsel to handle the litigation arising

from the commission's effort to prevent the overuse of sardines for the manufacture of fertilizer. This subject finally became of such supreme importance to the commission and the people at large that his employment was made permanent as attorney for the Commercial Fisheries Department of the commission to handle the sardine litigation and other matters pertaining to that department. The final result of this work for the commission has resulted in the saving of the sardine crop for edible purposes and has completely blocked the attempt of certain

B. D. Marx Greene, Executive Officer.

interests to commercialize this food fish for nonedible purposes.

On January 18th of the present year, Mr. Greene was chosen executive officer by the commission for the express purpose of reorganizing the commission and putting it upon a business basis. Mr. Greene was not chosen on account of intimate knowledge of fish or game, but to act as a business executive. Consequently, he plans to depend upon responsible department heads for the technical work of the commission and his time will be devoted mostly to coordinating these departments and putting the work of each upon an efficient and workable basis. Mr. Greene stands willing both to receive and accept suggestions and advice, and his future policy in handling the commission will be that of maintaining close contact not only with the men associated with him in the work of the commission, but with the general public. The Bureau of Biological Survey at Washington found this method of having a business executive to handle the routine overhead work a splendid one, and it is expected that the present plan will work out to the utmost satisfaction of all concerned. The department heads feel fully confident that the new executive officer will give the commission the best administration yet attained.

COMMISSION'S WORK REORGANIZED.

The work of conserving the fish and game resources of California is a great undertaking and the numerous employees of the commission must work together if real accomplishments are to be attained. Just as the efficient administration of any large corporation is dependent upon a selected group of department heads upon whom responsibility is fixed, so in the work of the Fish and Game Commission similar departmental organization has become necessary. In fulfillment of the promise to give conservation work a thoroughly businesslike administration, the work of the commission is to be accomplished through certain departments and bureaus. The main departments will be Administration, Patrol, Fishculture, Ladders and Screens, and Commercial Fisheries. Less important branches of the work will be designated as the bureaus of Accounts, Education and Research, Publicity, and Game Farms.

The executive officer will hold cabinet meetings attended by each department head and by such bureau heads as are needed for matters under discussion. At these meetings matters of policy and projected plans will be discussed. The executive officer will parcel out the actual work to the various departments and bureaus and will devote his time to matters of business management and policy. He is to supervise all the work of the organization, and each department and bureau head will report in writing monthly so that he may have full knowledge regarding activities and progress. District offices at Sacramento and Los Angeles will be subsidiary rather than independent.

Some idea of the working out of the

plan of organization may be obtained by the following skeleton outline of the functions of the various departments.

COMMISSIONERS.

I. Zellerbach, president, M. J. Connell, R. H. Clock.

The three Fish and Game Commissioners will determine upon general policy and organization. Departmental heads will be present at all meetings of the commission and will be consulted whenever policy concerning their department is determined. Full publicity will be given the actual policies set at these meetings.

EXECUTIVE OFFICER.

B. D. Marx Greene, executive officer and attorney.

The executive officer will be in reality the general manager of the organization. To him will fall the duty of coordinating the work of the various departments, passing judgment as to the necessity and feasibility of projects, determining precedents of projects and preparing the budget. Supervision of all legal work of the commission will also fall to his hands. Much of the routine answering of letters will be parceled out to various departments.

DEPARTMENT OF PATROL.

J. S. Hunter, chief of patrol.

Demand for a more unified patrol service has been met by the organization of a Department of Patrol with J. S. Hunter in charge. As the result of knowledge of law enforcement and long years of service, Mr. Hunter is eminently fitted for this position. The Department of Patrol will have complete charge of law enforcement work in the state with the exception of the fisheries patrol off the coast of southern California. The state is to be divided into a dozen or more districts and a captain of deputies will be appointed to have charge of the men in each district. Individual deputies will report directly to the captain of deputies and through him to the chief of patrol. In addition there will be a group of unattached men at the central office who will be held in readiness to be sent to any district in the state where assistance is needed. It is expected that under this system the work of the patrol service will be unified and that each man will know his duty and act accordingly.

DEPARTMENT OF FISHCULTURE, SCREENS AND LADDERS.

W. H. Shebley, in charge.

As in the past the duties of this department will be the establishment of hatcheries, the rearing of food and game fishes and the stocking of the waters of the state with the fish reared and the supervision of screen and ladder installation.

DEPARTMENT OF COMMERCIAL FISHERIES.

N. B. Scofield, in charge.

As in the past the Department of Commercial Fisheries will be charged with the regulation and control of commercial fishermen and canners, the compilation of statistics relative to the catch of fish and all matters pertaining to the conservation of the fish and fisheries along the California coast. There will be more rigid control of matters related to food fishes in the making of oil and fertilizer and the State Fisheries Laboratory will continue to secure data as to the life history and habits of the more important food fishes.

BUREAU OF ACCOUNTS.

H. R. Dunbar, assistant executive officer, in charge.

Mr. H. R. Dunbar, located at Sacramento, has been appointed assistant executive officer in charge of accounts. Mr. Dunbar will be entirely responsible for all the records and accounts of the commission. By means of a revolving fund it will be possible to pay expenses very quickly after they have been submitted.

BUREAU OF EDUCATION AND RESEARCH.

H. C. Bryant, in charge.

It will be the function of this bureau to continue educational work in the schools, to issue educational bulletins, furnish lectures, lend motion pictures and lantern slides and edit the quarterly magazine CALIFORNIA FISH AND GAME together with all other publications. It will also be the duty of this bureau to keep files containing data relative to the life history and habits of all game species and to supervise game research work of the commission.

BUREAU OF PUBLICITY.

Rolin G. Watkins, in charge.

For some time the Fish and Game Commission has needed wider publicity as to accomplishments and plans. The work of furnishing the newspapers with full information relative to activities of the commission will fall upon this bureau.

For the present this bureau will also have charge of pollution.

BUREAU OF GAME FARMS.

August Bade, in charge.

As provided by law this bureau will have in charge the importation, propagation and distribution of game birds. All matters relative to the new state game farm at Yountville will naturally fall within the sphere of this bureau.

RESULTS EXPECTED.

1. Each department and bureau head will know his place and function in the organization.

2. Each department and bureau will be furnished a budget and will know what new work can be undertaken.

3. Methods of procedure will be determined largely by the men concerned in the actual undertaking.

4. There will be opportunity for a working plan for future years.

5. Coordination of the work of the various departments and centralization of authority will greatly increase efficiency and assure better achievement.

SERVICE BULLETIN WILL BE ISSUED.

The employees of the Fish and Game Commission have become so numerous and they are so widely scattered that it has become necessary that a closer touch with a head office be secured through the issuance of a service bulletin. It is hoped by this means to unify the working force of the commission. The bulletin will contain information useful in building up a more efficient service. The first number, issued on January 30, contained articles on the new commissioners, the new executive officer and an outline of the departmental organization. Stress was laid on the reorganization of the patrol service as a distinct department with J. S. Hunter in charge. It is planned to issue this service bulletin regularly every month. The material will not be for publication and the bulletin will go to employees only.

COMMISSION'S WORK PRAISED.

In the April issue of *Sunset Magazine* (out March 15th), designated as the Fishing Number, an article, "Gasoline and Trout," by Walter V. Woehlke, calls attention to the good work now being done by the California State Fish and Game Commission to increase the trout population in our mountain streams and to prevent the yearly catch of sardines in California waters from being turned into fertilizer instead of food products. Credit for the recent marked improvement in these matters is given by the writer to the present vigorous administration of the commission under the leadership of Mr. Zellerbach.

The issue contains a number of other articles of special interest to fishermen. Chief among them is one by the noted author and sportsman, Zane Grey, entitled "The Log of the *Gladiator*." It is a vivid diary account of this famous writer's swordfishing experiences last summer off Catalina Island with a party of enthusiastic deep-sea anglers. "Mostly About Trout," as told by Tod Powell to D. R. Lane, urges sportsmen to make their trout fishing more of a fine art, and advocates more widespread use of the barbless hook, so that trout which have been caught may be returned to the stream without serious injury to them. "When you go trout fishing, fish for sport, and not for fish," is Tod Powell's argument.

IN MEMORIAM.

Henry J. Abels.

Relatives, friends and associates of Henry J. Abels, veteran employee of the Fish and Game Commission, were shocked to learn of his sudden passing on August 21, 1925. He was stricken with an attack of apoplexy while on duty in the Santa Barbara Mountains, about twenty-eight miles east of Santa Maria.

Henry J. Abels was born July 26, 1876, at San Luis Obispo, California, and was six years old when his parents settled in Santa Maria. In 1894, he was appointed United States Forest Ranger for the Santa Barbara National Forest, being one of the first rangers appointed in California. In 1899 he was appointed game warden for Santa Barbara County, which office he held eight years. He was appointed an Assistant Fish and Game Commissioner in 1906. In 1917, by unanimous vote of the board of supervisors, Mr. Abels was appointed county game warden of Santa Barbara County.

Deceased was past master of Hesperian Lodge No. 264, F. & A. M., member of Omar Commandery No. 30 K. T.; Al Malaikah Temple, A. A. O. N. M. S. of Los Angeles, and Santa Maria Lodge No. 90 K. of P.

Known for his courtesy, tact and fairness in the discharge of his duties, Mr. Abels made a host of friends. An enthusiastic worker, he was continually engaged in espousing the principles of

conservation. His untimely passing brought to an end an enviable record of nineteen years in state service.

Mr. Abels is survived by his wife, a son and a daughter.

Bernard Luttrell.

Bernard Luttrell, 27 years of age, who had for several months been a deputy of the Fish and Game Commission in Siskiyou County, was accidentally shot while on a hunting expedition on Moffatt Creek, October 12, 1925.

Bernard Luttrell and his father, Benjamin Luttrell, his uncle, Peter H. Luttrell, and his three brothers, Superior Judge Charles J. Luttrell of Yreka, Dr. Luttrell of San Francisco and George E. Luttrell, teacher at Tennant, California, had met according to custom for an annual hunting expedition on Moffatt Creek, their favorite hunting ground.

Bernard Luttrell was in a tree to get a better view of deer that might be stalked by his companions in the brush. On descending the tree the trigger of his gun caught on a twig, the weapon was discharged and one side of his head blown off.

He leaves a widow and three small children. During his service with the commission he proved himself to be a fearless and conscientious warden. Those who worked with him gave high praise to his ability.

DUCKS DIE FROM ALKALI POISONING.

Early in the fall reports came from the Tule Lake district of northeastern California and from the vicinity of Gridley in the Sacramento Valley to the effect that thousands of birds were to be found dead in these localities. Several investigations were started by federal and state officials. Judging by examinations made at the State University, statements to the effect that cholera was responsible are not tenable. Post mortem examinations of a number of ducks from the Sacramento Valley showed symptoms of alkali poisoning. The digestive tract was empty but filled with mucus, and there was a tendency for the inner lining to peel off. Otherwise the birds appeared to be in splendid condition. All bacterial tests proved negative. As has been true in the past, the disease disappeared after the first rain.

HATCHERY WATER SUPPLY.

In hatchery operations the purity and temperature of the water supply are all important. As a rule difficulty is to be found in the high temperature of the water in late summer, which gives trouble in keeping the fish in a healthy condition. In the case of one hatchery in the state it is the coldness of the water which has given difficulty. The water at the Tahoe Hatchery comes from a very cold spring, the water having a temperature of 38 degrees. Water at this temperature retards the growth of fish so that they are practically sixty days in development behind fish reared in warmer water. The water from this spring is also low in oxygen content. Plans are now being made to improve conditions by aerating and raising the temperature of the water about ten degrees by running it through a pond system and aerating fountain before it enters the hatchery. With this accomplished, fishcultural operations at this hatchery can be speeded up and greater efficiency gained.

GAME LAWS BECOME POPULAR.

Chas. E. Hughes recently made this statement: "The surest way to make government and law unpopular is to permit it to be both ineffective and annoying." Apply this to fish and game laws and we perhaps see the reason for their unpopularity twenty years ago. As the force of wardens has become more effective and their methods less annoying, fish and game laws have come into favor. No one thing has so greatly shown the change in attitude as the willingness on the part of judges to give maximum fines. In spite of present attainment there is still much to gain. With increasing settlement of the country and increasing number of foreigners to poach upon game resources, there must be more rigid enforcement. Too many people believe that law enforcement is wholly up to the game warden, whereas in reality the attitude of mind of each individual counts.

Help popularize fish and game laws!

NEW PLANS FOR GAME REFUGE BILL.

During the meeting of the Western Association of Fish and Game Commissioners held at Denver last August, representatives of five great conservation societies joined in drawing up a new plan for securing an adequate set of game refuges. Misunderstandings were cleaned up and a new start made when, by resolution, recommendations of D. H. Madsen, Fish and Game Commissioner of Utah, the chief opponent of the game refuge public shooting grounds bill which has failed to pass in two sessions of congress, were adopted. The resolution was as follows:

Resolved, That the action of the officers of the International Association of Game, Fish and Conservation Commissioners, in conference with the officers of the Western Association of State Game Commissioners, in accepting, in principle, the amendments to the Federal Game Refuge Bill offered by Commissioner D. H. Madsen of Utah, is hereby approved by this convention;

And be it further resolved, That the Western Association of State Game Commissioners, the International Association of Game, Fish and Conservation Commissioners, the American Game Protective Association, the National Association of Audubon Societies and the Izaak Walton League, are requested each to appoint one member of a committee of five for the preparation and the submission to congress of the bill in accordance with this resolution.

This committee was immediately appointed as follows: William C. Adams, Massachusetts, for the International Association of Game, Fish and Conservation Commissioners; David H. Madsen, Utah, for the Western Association of Game Commissioners; John B. Burnham, New York, for the American Game Protective Association; George H. Selover, Minnesota, for the Izaak Walton League of America; Dr. T. Gilbert Pearson, New York, for the National Association of Audubon Societies.

It was hoped that this getting together of advocates and opponents of the former game refuge public shooting grounds bill would eliminate the old snags of "new federal tax," "more federal bureaus" and "more federal policing." However, this was not to be. The proposed bill which was to substitute for the federal license fee a federal sales tax on sporting arms and ammunition as a means of providing funds for the purchase of refuges and maintenance did not meet with the approval of the administration. Consequently the committee voted unanimously for discharge because of the impossibility of accomplishing the object for which they were appointed.

A duplicate of last year's bill has been introduced in both senate and house and friends of the measure are asking opponents to forget differences, submerge prejudices and unite in support of the measure.

THE GAME WARDEN NEEDS SUPPORT, NOT CRITICISM.

At the meeting of the Associated Sportsmen's Clubs of California held on December 10th, the game warden was both abused and commended. When the only warden present was called upon he feelingly called attention to the habit of those reporting game violations of reporting the matter several weeks after the offense happened, of giving little real dependable evidence on which the warden might work, and of seldom being willing to appear in court as a witness. Certainly we are expecting too much of a warden if we expect him to catch single handed all violators in a district often comprising two or more counties.

One great step forward has been taken in the helpful attitude of judges. The next necessary thing is to secure the cooperation of all citizens in bringing to justice the violator of the game law. We are now sure that the courts will do their share in making the violator think twice before he acts.

PLAN BIOLOGICAL SURVEY OF LAKE TAHOE.

Mr. George A. Coleman, biologist for the Fishcultural Department, has made several important surveys in recent months. On completion of work at Clear Lake where a complete biological survey of the food available for fish in this lake was made, attention was turned to the Lassen National Park area. Encouraging reports were obtained relative to the plants of steelhead in Juniper and other lakes, and if recommendations relative to introducing a food supply in some of the lakes are carried out, fish in these mountain lakes will become more numerous.

Plans are now being made for a complete biological survey of Lake Tahoe. In addition to an effort to find out exactly the natural food supply available for fish, an attempt will be made to determine the depth at which the various kinds of fish found in the lake feed. Special copper line equipment will be utilized to make these determinations.

Another important problem concerns the white fish of the Truckee basin which has been greatly depleted. Efforts will be made to artificially propagate this fish. A number of hatcheries in the middle west specialize on the propagation of white fish and there is no reason why California should not be active in similar work.

THE ANNUAL KILL OF MULE DEER IN MODOC COUNTY.

The concentrated hunting which takes place in the lava beds in Modoc County is shown by the report of mule deer killed during the season of 1925 as reported by the forest service. The number actually checked within the Modoc National Forest shows 510. The average number checked in the past three years is 323. The season of 1924, on account of the closing of the forest, was a very light year, which brought down the total.

THE WORLD'S RECORD BROAD-BILLED SWORDFISH.

On July 12, 1925, Mr. F. A. Galespie of Beverly Hills, an executive member of the Tuna Club, took a broadbilled swordfish (*Xiphias gladius*) weighing 371 pounds. This proved to be the world's record. Equipment consisted of a 24 thread line with a breaking strain of 63 pounds. The fish took fifty-five minutes to land. Mr. Galespie was out for tuna when a big broadbilled swordfish was found loafing on the surface. Several times bait was thrown to within a few feet of the fish without result, but finally the swordfish became interested and was hooked. The previous record for this fish was 528 pounds, a record held by Mr. Harry J. Mallen.

VIOLATOR HEAVILY FINED.

As an evidence of his determination to aid the Fish and Game Commission in the enforcement of the fish and game laws, Judge Ernest Windle of Avalon, Santa Catalina Island, recently imposed a fine of $400 upon a violator, together with ninety days suspended sentence. Peter Zar, an Austrian fishing out of San Pedro, was the defendant in the case and was brought into Judge Windle's court by fish and game deputies Walter Engelke and N. C. Kunkle for a violation of the law which prohibits the use or possession of a purse seine in fish and game district No. 20.

ARE WE COMING TO CLOSED SEASONS ON TROUT?

Overfishing in some sections of the state is causing the angler anxiety. Depleted streams in other states are satisfactorily handled when the Game Commission has plenary powers and is able to close them. In California it takes an act of the legislature to close a stream to fishing.

A recent report from Michigan is to the effect that following a survey of the trout streams of that state by several experts, the game commissioner advocates the closing of all trout streams of the state for a period of five years.

The fish hog may well ponder over this recommendation. If care is taken and if a fisherman thinks about the other fellow who may want his share from that stream, there is real hope that no such policy will be adopted in this state. If, however, each angler selfishly gets all he can continually, our streams are bound to be depleted and drastic measures will become necessary.

PELICANS AND FISH.

Man is forever condemning some bird or some animal for its depredations. Sometimes these accusations have a basis in fact, and at other times they are chance judgments. In view of the fact that sentiment against the pelican and cormorant secured emendation of the law and placed these two birds on the "black list" the following summary of investigations by E. Raymond Hall under the direction of the Bureau of Biological Survey during the summer of 1924 are pertinent. In an article entitled "Pelicans vs. Fishes in Pyramid Lake" published in *The Condor*, Vol. 27, pages 147–160, the following summary appears:

The white pelican is not detrimental, either directly or indirectly to the fishing industry of the Pyramid Lake region. However, local sentiment is in the main antagonistic toward this bird, because it is *believed* to eat large numbers of trout. With the increasing popularity of Pyramid Lake as a summer resort, and with the present lack of protection accorded this bird, the species will, in no great length of time, cease to breed there.

It is true that trout are decreasing in numbers, both in the lakes and in the rivers of the region. This is due to a multiplicity of causes. Most important of these is the depletion of water in the Truckee River. Formerly, between October and June, the common trout of Pyramid and Winnemucca lakes, *Salmo henshawi*, ascended the Truckee River to spawn. Fish culturists say that this, like some other species of trout, requires running water to insure fertilization of the eggs, hence it can not reproduce in the lakes. Insufficient water in the Truckee River at the critical season not only prevents most of the fish from reaching their spawning grounds, but results in the death of those fish that do get into the river. On May 17, dozens of *Salmo henshawi*, weighing from 5 to 18 pounds each, were found dead in pools of the Truckee River just below the Indian Reservation Dam. Conditions of this kind have existed in previous years at other dams along the river (see Snyder, 1917, p. 42). The fish could not pass the Indian Reservation Dam because there was no water to flow through the fish ladder. Later in the year fish died along the river in great numbers because of the stagnant condition of what water there was. The stench from decaying fish is said to have become so offensive that, near Reno, men were employed to bury them. This lack of water is the result of dry seasons, construction of the Derby Dam (which is said to divert the water that naturally flowed down the Truckee River into the Carson River), and the general withdrawal of water for irrigation purposes.

Only one of the Nevada irrigation ditches taking water out of the Truckee

River has a screen, according to persons familiar with the situation; and this screen was stated to be inadequate. None of the ditches that I examined had a screen. A heavy toll of trout is taken when the fry wander out into the smaller ditches and into the fields. The Derby Dam, the largest of the several dams in the river, has no adequate fish ladder by which the fish may ascend to their former spawning grounds.

Sewage from the several cities and refuse from sawmills and paper mills are emptied directly into the river, and are unquestionably detrimental to the fish life, especially at periods of low water. Some of this refuse is said to accumulate in pools and kill the spawn of the trout.

The critical factor in the welfare of the trout of Pyramid and Winnemucca lakes is the condition of the Truckee River, which, for the reasons stated above, no longer permits of the fish ascending to their spawning grounds. Furthermore, the river is no longer supplying the normal amount of water to the two lakes. Indeed, the level of these lakes goes down several feet each year. The development of other irrigation projects along the Truckee River now under consideration, including the construction of reservoirs, will no doubt further decrease the amount of water reaching Pyramid and Winnemucca lakes.

The white pelican, then, is probably in no way responsible for the decrease which is so apparent in the number of trout. The causes of this decrease are man-made, and those which are believed to be the most salient have just been pointed out.

CALIFORNIA LEADS IN FISHERIES.

The statistics for 1922, compared with those available for former years, strikingly reveal the changes taking place in the Pacific coast fisheries. With the development during the last decade of the tuna and sardine fisheries, California has forged ahead to the leading place among the Pacific coast states. The number of persons engaged in fisheries increased from 4129 in 1908 to 8452 in 1915 and 9173 in 1922. The investment increased from $1,659,000 in 1908 to $5,824,263 in 1915 and to $13,047,414 in 1922. The value of her products increased from $1,970,000 in 1908 to $2,506,702 in 1915 and to $6,773,981 in 1922.—Annual Report of the Commissioner of Fisheries, year ending June 30, 1925.

MOUNTAIN SHEEP INTRODUCED.

W. R. Hearst is making some interesting experiments with big game animals on his ranch at San Simeon, California. Sizeable herds of buffalo, elk, antelope, deer, reindeer and wild goats are to be found on 450 acres of fenced land. The most recent introduction is of eighteen Rocky Mountain bighorns secured in Alberta Park, Canada. Mr. Hearst now owns the largest collection of big game animals in the state, and the results of his experiments will doubtless determine to what extent the Pacific Coast Sportsmen's Club and similar clubs will pursue their intention of establishing large game preserves.

FISHING AT CATALINA.

Angling near the Channel Islands continues to attract anglers from far and near. That large fish are available and make the journey worth while is evidenced by the annual awards of the Tuna Club. For the season 1924 the largest fish were as follows: tuna, heavy tackle, 149½ pounds; tuna, light tackle, 117¾ pounds; marlin swordfish, heavy tackle, 345 pounds; marlin swordfish, light tackle, 191 pounds; broadbill swordfish, heavy tackle, 528 pounds.

J. W. Jump secured the Brewster medal for the largest tuna. It weighed 191 pounds.

FUR CONSERVATION ESSENTIAL.

The perpetuation of fur-bearing animals in the wild is as much a matter for public concern as the conservation of any other natural resource. Although administration of forests, fish and game may rest with either individual states or the federal government, the maintenance of the fur supply is primarily the business of the states. The United States Department of Agriculture is charged with the enforcement of the Federal Lacey Act, a law which regulates interstate commerce in wild animals and supplements state legislation in efforts for the conservation of fur animals. In administering the law the attitude of the department is one of cooperation and coordination and not federal control.—U. S. D. A. Farmers Bull. 1469.

BLACK-TAILED DEER SUCCESSFULLY REARED.

On Decoration Day, four years ago, our neighbors out on a picnic found a female black-tailed fawn just born and not even able to stand up. Believing it deserted, they brought her back to us that evening and we fed her warmed cow's milk from a bottle and nipple. As this food made the fawn sick, we tried boiled milk and water in equal parts. Under this diet she quickly recovered and soon became a wonderful pet, following us everywhere like a dog and crying "ma-ma" like a baby to let us

know she was hungry. We fed her about every two hours during the day and twice during the night. We named her Yvonne.

The following November, a young man who was leaving town and who was the owner of a five-year-old buck asked the Fish and Game Commission permission to transfer him to us. Dick was a nice three pointer, of ordinary size, quite gentle.

The next year after in May, another female fawn was found on the Orrs Spring road by the body of her dead mother and nearly starved. We raised Pierrette by the same method that we did Yvonne. She had exactly the same habits, sleeping at the same places, asking for her milk the same way.

Two years ago in August, Yvonne had her first baby, Maggie, and a week after, we were very much surprised when Pierrette, only fifteen months old, become mother of a beautiful little buck, Jiggs. Very few people know that it takes two hundred days for a doe to have a fawn.

Last year in July both had twins and this last June, Yvonne, Pierrette and Maggie (the first deer born in our place) gave us six more fawns.

In less than four years, starting with two female fawns and a buck we found ourselves possessing a herd of fifteen deer.

FIG. 10. Complete series of antlers from a nine year old black-tailed deer. Here is evidence that the number of points does not accurately indicate age. Photograph by R. O. Rampont, Ukiah, California.

Although we have just a block of ground in the center of the city of Ukiah, yet it is an ideal place for them, just like a forest.

All the deer are in fine shape all year long. Every morning each one gets about a quart of rolled barley. During the spring and summer we feed them grass, alfilaria, kale, any kind of vegetables, especially potato peelings, brush (poison oak, chamiso, madrone, oak limbs, fruit tree leaves.) Later we give them grape suckers and ripe fruits, and in the winter, dry alfalfa and acorns. They have rock salt all the time. They

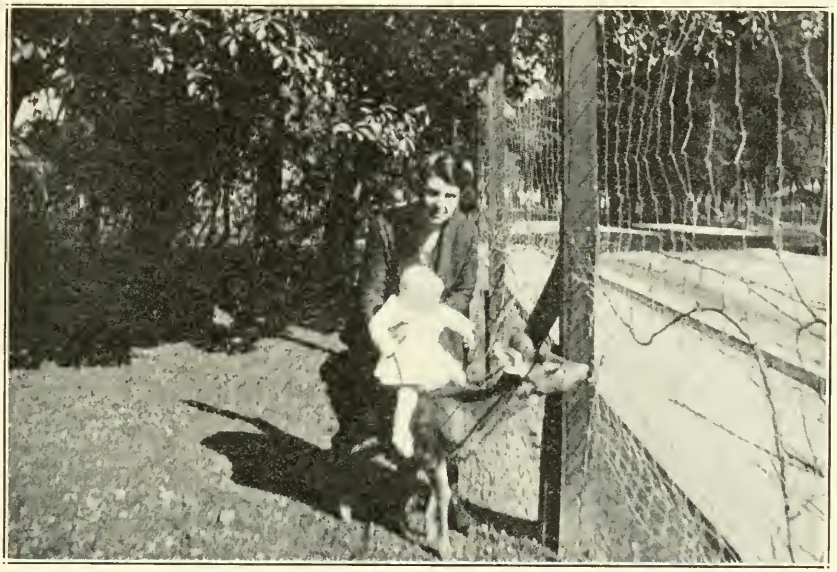


FIG. 11. A black-tailed deer reared by R. O. Rampont, Ukiah, California. Photograph by R. O. Rampont.

are very fond of bread, candies, peanuts, cigarettes and chewing tobacco.

Our bucks lose their horns about Washington's birthday. The accompanying picture shows Dick's entire set of horns when nine years old. (See Fig. 10.) You will note that for five years he was a three pointer, the last two years a four pointer. Jiggs, only two years old, is a three pointer. We are convinced that horns do not always indicate the age of a deer.

We have demonstrated what can be done in deer farming when proper care and protection is given. Judging from our experience, it should be possible to increase the game in any part of the United States.—R. O. Rampont, Ukiah, Cal.

OPEN SEASONS FOR FUR BEARERS.

Ill-advised open seasons are a natural result of lack of sufficient information regarding the life habits of fur animals on the part of farmers, trappers, members of the fur trade, legislative committees and even of conservationists. The seasons established by a number of states do little to prevent the decrease of fur bearers in certain sections. A defect frequently noted in present fur laws is that the open season provided is so long that it permits trapping before pelts are prime in fall and after breeding is in progress in spring.

Fur is in prime condition for harvesting at one brief season only. An open season of more than three months duration is not justifiable anywhere in the United States if the prime condition of peltries and the economic status of fur animals were taken into consideration. That the seasons are not wisely determined is emphasized by the fact that far too many unprofitable pelts are coming to the raw-fur markets every year. A keener appreciation of conditions revealed by studies of the habits, breeding seasons and periods of prime fur on the part of those concerned with the framing of laws and regulations governing trapping would result in increased pelts of superior quality reaching the markets, thus allowing greater financial rewards to trappers and

at the same time augmenting the numbers of breeders in the covers.

A few generations ago furs of many kinds were commonly taken in all sections of the country, but now, with the depletion or extinction over great areas of certain of the more prized species, the most valuable fur bearers, from the viewpoint of financial returns from the annual catch, are muskrats, skunks, raccoons and opossums.—U. S. D. A. Farmers Bull. 1469.

AN ANTI-POLLUTION PLATFORM.

Congressman Clarence MacGregor in an address before the New York Waterways Association quoted and endorsed *The Outlook's* anti-pollution platform:

The nation has an inalienable right to clean waters.

Disposition of the waste of industry is a proper charge against industry, and against industry alone.

No corporations and no communities have any more right to pollute the waters with their waste than have citizens to dump refuse on their neighbors' property.

He is not an alarmist when he says:

Civilization must not be allowed to destroy itself. We must not be blind to the fact that the destruction of natural resources is suicide. Our civilization is too ruthless. We dry up our streams by failing to protect our forests. We kill the bird life by taking away their dwelling places and leave the fields open for the pests that destroy our agriculture. We kill off our fish by destroying their home. We create cesspools from which to extract our drinking water. We fill our graveyards with the victims of our barbarity. We are more than foolish. We are absolutely stupid.—*The Outlook*, Oct. 28, 1925.

CAUSES OF FUR DEPLETION.

The value of the annual catch of fur-bearing mammals in the United States 25 years ago it was roughly estimated at $25,000,000. Today it is estimated at $70,000,000. If the supply of fur animals had been maintained in suitable areas the income to trappers would have greatly exceeded present-day values. Much of the actual loss on furs taken could be eliminated by confining trapping to periods of prime fur, exercising care to remove pelts properly and to cure them thoroughly before shipment to raw-fur receiving houses.

Trapping too early or too late and failing to care for furs properly have resulted in a loss of approximately 20 per cent of the annual catch. Receiving houses are responsible for much of this waste by sending out early price lists containing quotations on prime furs not obtainable at the time a formal invitation to the trapper to begin operations at once. By such action not only does the receiving house accept unprime pelts but the trapper gets a smaller return than he would have received by starting operations during the season of prime fur. All fur bearers increase rapidly under reasonable protection, and if the unprime animals now killed every year were left for breeding stock this probably would not decrease the annual catch more than 5 per cent, and within five years the supply of wild fur animals would without doubt be increased 50 per cent.—U. S. D. A. Farmers Bull. 1469.

That many trappers have been permitted to ply their trade out of season and to gather pelts to the point of extermination of the fur bearers over large areas is only one cause for our present shortage. Serious responsibility rests also on fur buyers and their agents, who, by accepting at a price all skins offered, thus marketing illegal pelts, tempt trappers to make a thorough clean-up all along their trap lines. Another factor in the scarcity of fur animals is found in the greatly reduced fur-producing areas. The encroachment of civilization naturally reduces the extent of such areas, but more thought and attention can well be given to the indiscriminate drainage of swamps and to the unnecessary cutting and destroying of forests and cover.

Taking an unprime pelt is a deliberate waste of one of nature's most valuable and beautiful gifts, and not until trappers and raw-fur men learn to look upon it as such will the best use of our valuable resources in fur be realized.—U. S. D. A. Farmers Bull. 1469.

ARIZONA ESCAPES GAME LAW MUDDLE.

Last fall Arizona attempted to recodify its game laws by means of referendum. The move was sponsored by the State Game Protective Association and the state game warden. It was intended to submit the matter to the voters at the general election in 1926, but the legislature at the last meeting ordered it submitted this year. As a consequence passage of the measure would have closed all legal hunting and fishing in the state, abolished the state game department, fish propagation work and all other activities until the legislature met and new laws were enacted. As a consequence it was necessary to first put on a campaign asking sportsmen to kill the bill, and later by means of an injunction to order the Game Law Repeal Bill off the referendum ballot. Through the last method the situation was saved.

"THE CODE OF AN ANGLER."

1. He holds that a good fisherman not only can catch fish but is one who rigidly conserves angling as a sport.

2. He realizes that fish must have homes in which to live, therefore he sees to it that good forests and waters are made available and kept available for abundant fish life.

3. He knows well the enemies of the fish—the water snake, the hawk, the otter—and he takes of his time and money to rid fish life of these menaces.

4. He loathes that human "fish-hog" who ruthlessly wastes and destroys, and he vigilantly brings to bay these robbers of our fish.

5. He is tortured by that ghastly nightmare, pollution of waters, and he fights everlastingly to keep clear waters clear, and to redeem foul waters to purity.

6. He is a student of fish life and habits. Thus he knows that both the size and number of fish depend directly upon the abundance of the food supply. Therefore he conserves bait life, and water vegetation.—*Forest and Stream*, April 1925, p. 216.

THE REAL SPORTSMAN AND THE BAG LIMIT.

The days when admiration went to the man who boasted of his big killings and of exceeding the bag limit are fast passing. Sentiment now favors the sportsman who has a "gentleman's limit."

Many a sportsman who in days past has been accustomed to getting the limit, now believes in fixing his own bag limit. Furthermore he is willing to express his ideas in the hope that others will see the wisdom of taking only a fair share.

In California, too many sportsmen still kill more game than they are able to use. Game is vanishing as civilization advances, and a love for and desire to perpetuate the wild things of nature as well as a desire for more fish and game should induce the real sportsman to fix his own bag limit, regardless of the sneers of some of his fellows, whose selfish practices will turn from them the very favor which they seek—the favor of public opinion.—B. E. P.

WARDEN POSTS SIGNS.

Game Warden W. B. Sellmer of Marin County posts the following warning as he patrols his county:

GAME WARDEN

W. B. SELLMER

IS DUE

HERE TODAY

He Might Be Watching You Now

Are You Hunting or Fishing Within the Law? IF NOT

Can you afford to have your reputation ruined by a fish or game violation?

Can you afford to be recognized as a fish or game hog by the public?

Can you afford the publicity usually given such a violator?

Can you afford to be branded as an unreliable and untrustworthy citizen?

Can you afford to pay a heavy fine or serve a jail sentence?

YOU CAN NOT!

DON'T TAKE A CHANCE

Such a reminder may set many a violator to thinking. The results will be watched with interest.

THE LIFE HISTORY OF THE GRUNION.

The highly specialized spawning habits of the grunion or "little smelt" are very different to those of other known fishes. In fact, its adaptation of the tides and its method of laying its eggs to protect them from marine enemies is one of the really remarkable stories in the annals of natural history.

Fish Bulletin No. 10, a contribution from the State Fisheries Laboratory entitled "The Life History of *Leuresthes tenuis*, an Atherine Fish with Tide Controlled Spawning Habits" by Frances N. Clark is a continuation of the work begun by W. F. Thompson.*

During the months of March, April, May and June, or after the highest tide, this fish comes in on the sandy beaches of California to spawn. The female lays her eggs several inches below the surface of the sand and far above the level of the average tide.

Although in this way the eggs escape the dangers of the sea, certain enemies less formidable confront the larvae of the grunion. The *Saprinus sulcifrons*, a beetle, boring its way into the sand, often uncovers and devours them. But the greatest dangers are to be found in physical conditions. Should the sand so dry out that the eggs lose their moisture, should they be swept out to sea too soon after spawning, or should they fail

* Thompson, W. F., 1919. The Spawning of the Grunion, *Leuresthes tenuis*. California Fish and Game Commission, Fish Bull. No. 3.

to be liberated from the sand at the proper time—these are the real dangers to which the eggs are subject. But the fish is usually able to escape these perils. It runs in with the highest waves shortly after the full moon which enables it to reach the area where the sand is being deposited. This prevents the eggs from being washed out by succeeding tides. The tides accompanying the dark of the moon just two weeks after the spawning are very much higher and uncover and liberate the larvae.

Experiments have proven that the larvae can not liberate themselves from the sand, but must await the action of the waves for their deliverance. They are capable of lying in their capsules for two weeks after the proper time for hatching (an unusual phenomenon) but this is injurious and results in the failure of many of the young to survive. So the failure of the tide to reach them at their normal hatching time and deliver them constitutes a grave danger.

Miss Clark has brought out in her paper the following new facts in regard to the life history of the grunion:

1. Growth of the ova toward maturity begins as early as January and continues throughout the spawning season.

2. As soon as one batch of eggs matures and is spawned out, another batch begins to develop, is matured, and spawned out two weeks later. Thus, after an individual fish starts spawning it continues to spawn periodically on each series of high tides throughout the breeding season.

3. The interval between spawnings is apparently fifteen days instead of two weeks. This condition results in the fishes spawning on later and lower tides during the higher series of high tides than on the lower series of high tides.

By a study of the scales and length-frequency data, it was found that *Leuresthes* matures at the end of the first year. For the population studied, approximately 25 per cent of the fish spawn again at the end of the second year and 7 per cent at the end of the third year. No fish were found spawning at the end of the fourth year.

Leuresthes grows rapidly during the first year, the males reaching an average length of 110 mm. and the females of 119 mm. After the first year and the resulting attainment of sexual maturity, increase in length falls off rapidly, but increase in weight continues at only a slightly diminished rate.

As a result of the long protracted spawning season, growth of the mature fish ceases during the months of May, June and July, and is resumed again in the fall. This cessation of growth during the summer months results in the formation of a breeding annulus on the scales. Growth continues during the winter and a winter annulus is formed only in rare cases.

CALIFORNIA'S GAME BIRDS ENJOY WINTER IN ALASKA.

A notable scarcity of such migratory wild fowl as ducks and geese occurred during the recent fall and winter flight in a number of the western states, particularly in California. Sportsmen and others interested in the conservation of our wild life have expressed alarm at this scarcity, fearing that this indicates a permanent decrease in the numbers of these birds.

The Biological Survey of the United States Department of Agriculture recalls, however, that there was a notably large northward flight of birds in the spring of 1925, and that the situation looks far more serious than it is. The warm winter on the coast of British Columbia and southern Alaska is without parallel. No snow is reported below the 1000-foot level in the very region of southeastern Alaska where a year ago deer were starving owing to the heavy snowfall which buried their food.

Telegraphic reports to the Biological Survey during the third week of January, 1926, showed an unprecedented number of ducks and geese remaining along the coast of southern Alaska and northern British Columbia. An abundance of ducks and geese has been noted as far north as the flats about the mouths of the Copper and Bering rivers. From Wrangell, Alaska, come reports of many ducks and geese on the flats near there, and the Stikine River flats in northern British Columbia are reported to be free of snow and ice. A wireless dated January 22 from the Alaska Game Commission advised the Biological Survey that large numbers of mallards and thousands of geese were on the Stikine flats, a remarkable occurrence for this time of the year.

The scarcity of birds in various parts of the west during the fall and winter of 1925 and 1926 does not necessarily mean a corresponding actual decrease in the total number of the existing wild fowl. Mild fall and winter weather in southern Canada and along the northern border of the United States and the deficient rainfall in the west have caused erratic movements among these birds, many of their usual haunts having been passed over by them in the southward flight.

The fact that millions of birds are

reported on some of the large wintering grounds in the southern parts of the country is evidence that vast numbers of them have come down from the north.

BACK TO PRIMITIVE METHODS.

A newspaper item states that three archers invaded the Siskiyou Mountains during the deer season. We must at least admit that hunters so armed must use greater skill in securing their game, and certainly the more ingenuity one puts into the hunt the more he gets out of it, at least in mental stimulus. With both high school and college students practicing archery, it may well be that the bow and arrow will have to be considered in future legislation. At present no game laws mention this sort of weapon.

ORGANIZATION SEEKS LIMITATION OF FIREARMS.

Branding firearms as mere aids to reds, robbers, bandits and hold-ups, certain organizations attempt to curtail the use of weapons. Discovering that one-half million revolvers are delivered in the United States mails annually, one organization plans to ask congress for a law making pistols and revolvers nonmailable, and would place the issuing of permits to purchase revolvers under authority of the United States Army. The organization which supports this point of view is called "The American Reclamation Society, Inc." Its last advertising campaign was made through literature of a well known milling company. The movement is said to be nation wide.

Undoubtedly there is need for more care in the use of dangerous weapons, but the constitution of the United States guarantees to every man a chance to defend himself. There are few who grant that this society is taking the proper means to improve conditions.

FOOD OF PHALAROPES, AVOCETS AND STILTS.

Phalaropes have long claimed interest by bird students because the males are plainly garbed, incubate the eggs and rear the young. Anyone who has watched these birds as they spin and dab on the surface of the water has speculated as to their food. A recent bulletin (U. S. D. A. department bulletin 1359) brings interesting information relative to the food of these birds. The northern phalarope is a fairly common migrant in California. According to the results of stomach examination, the food of this bird is made up almost entirely of animal matter, beetles and flies being taken in largest quantities. Some small weed seeds are also consumed. Most of the the food is of slight economic importance as the forms taken are of no significance in relation to crops or other products. However, during May and June, large quantities of mosquito larvae are consumed. The food of two summer visitant birds which frequent alkali ponds in the interior valleys is given in the same bulletin.

The avocet appears to be a notable destroyer of weevils and the black-necked stilt of bill bugs. This comment is made on the avocet as a game bird: "In some regions the 'snipe,' as the avocet is sometimes known, is considered a game bird or is hunted for food. Shooting avocets has no element of sport, however, as it is easy to walk within gun range of them, and they are fearless and frequently come around to examine the hunter. Though the birds are of fair size, the flesh is not savory and offers no excuse for killing them. They rightfully have been removed from the category of game birds and are now accorded full protection under the regulations of the federal migratory-bird treaty act. This is fortunate indeed for their continuance, as they are large and conspicuous and easily killed. They rear but one brood of four young each season and are subject normally to many dangers, so that with shooting the species would soon be exterminated. With increase in cultivation of lands throughout their range their haunts have been much restricted. The birds remaining have in many instances been brought into closer relation with man, so that the good they do is more apparent."

In that these shore birds usually arrive long after the hunting season has closed, and depart before the fall opening, they are accorded fair protection in California.

COMMITTEE TO INVESTIGATE STATUS OF RUFFED GROUSE.

The periodic cycles of scarcity and abundance of the ruffed grouse in eastern states has been the subject of conversation among sportsmen for many years, but until recently there has been no serious attempt to solve this fundamental problem. An investigation committee was appointed by the American Game Protective Association in December, 1924. Two workers on the problem, Dr. A. A. Allen of Cornell University, and Dr. A. O. Gross of Bowdoin College, are obtaining valuable data. In October, 1925, the Massachusetts Fish and Game Protective Association formed a subsidiary committee and this committee hopes to raise a fund of $10,000 to carry on an

investigation over a period of years. The radio is being used as a means of interesting persons in the investigations and of securing the necessary specimens for the use of the scientists actually engaged in the work.

PROPOSED SANCTUARY FOR WILD ANIMALS IN SOUTH AFRICA.

A bill for the permanent establishment of a great national park and sanctuary for wild animals will come before the union government of South Africa. Hopes are entertained that a final obstacle, the presence of some privately owned land within the scheduled area, will be overcome, and that the union, by passing the bill, will create an asset of the highest commercial, popular and scientific value.

The Transvaal, in which the proposed park is situated, has the credit of being the first state in Africa to realize the importance of protecting wild life. In March, 1898, two years before the conference of African powers called by the late Lord Salisbury led to the establishment of reserves and sanctuaries in many parts of Africa, the Transvaal government had set apart a district on the Sabi River between the Drakensberg Mountains and the Lebombo Hills adjoining Portuguese East Africa, as a sanctuary in which it was forbidden to "hunt, shoot, seek or in any way to intimidate, to chase or to drive, or in any way disturb any game or birds in the game reserve."

The country is known as low veld or bush veld. From east to west it rises in height gradually from about 400 feet above sea level to about 2000 feet. It is subtropical climatically, and consists of a series of undulating ridges and steep-cut water courses forest clad except below the 1200 foot level, where it becomes savannah country with rocky outcrops, the home of troops of baboons. There are a few large perennial rivers flowing from west to east and a multitude of tributary water courses, most of them now as a result of the gradual desiccation of South Africa dry except during the rains.

In 1923, under pressure from the companies, the government excised the whole western area of the reserve, amounting to about 1,500,000 acres, between the Olifants River on the north and the Crocodile River on the south.

There remain about seventy farms within the area which are still private property, and it is the acquisition of these at a fair price that is the final obstacle to be overcome. If these are purchased and the remaining area of the original reserve permanently established by the union government as a national park and sanctuary, as contemplated by the bill, South Africa will gain possession of one of the greatest reserves in the world.—*Science*, Aug. 14, 1925.

VIREOS DESERVE ENCOURAGEMENT.

During the summer almost anywhere in the United States at least one species of vireo, and usually more than one, is to be found flitting about in the trees or shrubbery. In the east and central regions the common species is the red-eyed vireo, but the white-eyed, warbling, and yellow-throated vireos also are abundant. The Philadelphia, blue-headed, hutton and Bell vireos are more or less widely distributed. As with other common species of birds, the question as to whether or not vireos are beneficial is legitimately raised, and to answer it, the Biological Survey of the United States Department of Agriculture has made a study of their food habits, by examining the stomach contents of a great many of these birds.

The conclusions reached are set forth in a recent report (Department Bulletin 1355), "Food Habits of the Vireos: A Family of Insectivorous Birds." The food of the several vireos is shown to be very similar though sometimes varying in proportions. Most of the insects eaten are either neutral or definitely injurious in their economic relations, and may be placed on the credit side of the account of these birds. All vireos are especially fond of caterpillars. Scale insects are a notable item of vireo food, and other tree pests are freely eaten. Many destructive weevils were found in the stomachs examined, including such forms as the clover-leaf, clover-root, cotton-boll, and nut weevils, the plum curculio and bark beetles. Vireos also destroy ants and grasshoppers. Useful insects taken by the vireos include some of the hymenopterans, predacious bugs, and beetles, among which are ladybird beetles, which are almost uniformly beneficial. Although it is regretted that vireos consume as many ladybirds as the evidence indicates, yet they also devour many of the pests attacked by the ladybird, which must, in part excuse them. As fruit-eaters the vireos are practically harmless.

Those interested in the bulletin may obtain a copy, while the supply lasts, by writing to the United States Department of Agriculture at Washington, D. C.

CONSERVATION OF WILD LIFE PRESENTS COMPLEX PROBLEMS.

To protect the lives of the useful or harmless wild animals and birds of the country and at the same time to guard growing crops and livestock against depredations of injurious wild life is the com-

plex problem in conservation which the Biological Survey of the United States Department of Agriculture is constantly facing and attempting to solve. The services of this bureau become more important as time goes on and the scope of its organization is enlarging accordingly. Especially has this been the case during the fiscal year ended June 30, 1925, according to the annual report of the chief of the Biological Survey.

The increasing occupation and development of the United States, says Doctor Nelson, make it increasingly difficult to maintain even a fair representation of the once enormous natural resources in game and fur-bearing animals and game and insectivorous birds in this country. At the same time, the wide-spread herds of domestic stock and the extension of the farming areas have given predatory animals and harmful rodents of many species an abundant food supply, under the influence of which their numbers increase and necessitate active control.

To accomplish the varied tasks involved in these problems calls for field and laboratory investigational work by trained specialists, and the maintenance of warden service to safeguard federal wild-life refuges and to enforce federal game laws, as well as a force to conduct field campaigns to control wild animal and occasional bird pests.

The economic phases of the bureau's work have included operations for the control of predatory animals, chiefly in the west. Skilled hunters have been detailed to take these destructive animals wherever they occur, and to patrol borders especially in Arizona and New Mexico for animals coming across the international boundary. That predatory animals have been considerably reduced in numbers is shown by the fact that 352 wolves were taken, 37,255 coyotes, 228 mountain lions, 2945 bobcats, and 61 Canada lynxes. In addition probably twice as many coyotes were killed in poisoning campaigns. Measures to reduce the numbers of coyotes and bobcats have also served to check the spread of rabies, which is carried by these animals. In cooperation with state extension services and other state and private organizations, constant warfare is waged by the Biological Survey against injurious rodents, which consume vast quantities of grain and grasses in the West.

The study and conservation of fur-bearing animals, for many years one of the projects of the bureau, has been since July 1, 1924, designated as a separate division of fur resources. Under this division is maintained an experimental fur farm at Saratoga Springs, N. Y., for investigational work in the propagation of fur-bearing animals in captivity.

The Alaska game law, passed by the last session of the 68th congress, provided for the establishment of an Alaska Game Commission of five members, all residents of Alaska, and one of them the chief representative of the Biological Survey in the territory. The resident commissioners appointed by the Secretary of Agriculture to enforce the law and the regulations promulgated by him will have available for their use the vast store of information on birds and mammals in the files of the department and the cooperation of the Biological Survey.

The appropriation of funds by congress for the establishment of the Upper Mississippi River Wild Life and Fish Refuge, extending for about 300 miles between Rock Island, Ill., and Wabasha, Minn., has brought the number of federal wild-life reservations under the jurisdiction of the Biological Survey to 70. These refuges and preserves for wild birds and animals are distributed over the United States, and in Porto Rico, Hawaii and Alaska, and constitute an extensive phase of the conservation work of the bureau.

Copies of the annual report of the Bureau of Biological Survey may be had, while the supply lasts, by addressing the United States Department of Agriculture, Washington, D. C.

A FISHERMAN TO HIS SON.

By MAURICE M. FRINK.

My son, when you have older grown
I'll take you to a lake I've known
At midnight, noontime, dusk and dawn;
I want to show you where I've gone
To find my freedom—where I've spent
Days of gladness and content.
I want to be in the boat with you
When the bass are hitting—want you to
Learn from me,
O son of mine,
How to swing
A fishing line!

I've been young—too well I know
The rocky road your feet must go.
But I know, too, a path that clings
To wooded hill where the peewee sings,
Where dogwood grows, and oak and pine;
And all I ask, O son of mine,
Is to row a boat for you some day
Along that shore where the willows sway—
To be with you
When first you feel
A leaping bass
Unwind your reel!

I want my son to sleep, as I
Have slept, beneath the sky—
I want the day's first gleaming dim
To waken something deep in him;
I want my boy to learn to take
His troubles to that shining lake
And lose them there. And so I wish,
O son of mine, that you may fish!
For my boy's sake
I ask it, God—
Teach him to love
A casting rod!

FACTS OF CURRENT INTEREST.

At Medicine Lake the forest ranger reported 76 deer killed during the first twelve days of the open season.

From Audubon societies and women's clubs have come many protests against the new law passed by the last legislature which took protection from the cormorant and white pelican. The California brown pelican still receives protection.

Considerable complaint was made by deer hunters because present laws allow no legal method of taking deer from an open district into a closed district. Much was made of the possible waste of venison because of the restriction, but little of the added protection afforded deer.

The new state game farm at Yountville is now a reality. Equipment is installed and over a thousand pheasants have been hatched.

An investigation as to the cause of death of deer in the epidemic in northern Sonoma County has been instituted.

Last fall an attempt was made to market in San Francisco several barrels of cold storage game birds from South America. Three varieties of tinamous were identified in the shipment, including the famous large rufous tinamou.

During October and November, the educational department of the commission gave twenty-two lectures, most of them at schools, with a total attendance of 8650.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

PURSE SEINING IN SOUTHERN CALIFORNIA.

When the new law relative to purse seine boats went into effect in southern California, it no doubt made things look pretty blue for the purse seine boat owner. As it was these boats were getting most of their revenue from the barracuda catch. On seeing that it was unlawful to take barracuda with the purse seine, they immediately began to look for some other way to use these boats and nets. Some of them went to Mexico, chartered a barge, which they anchored down there to leave their nets on (we would not let them bring barracuda in here with net on boat) and have been going to Mexico for barracuda ever since. Some of the boats appear to be doing well. When they prohibited the taking of barracuda in our waters, the price went up, there naturally being a scarcity. The gill netters are making pretty fair catches now and they will eventually be able to supply the market in good shape.

Quite a few of the purse seine boats have been used this summer for tender boats carrying tuna and skipjack from the barges in Mexico to San Pedro and San Diego. This sardine season there will be something like twenty purse seine boats fishing sardines with the purse seine. There are about six of them operating now and about fifteen more getting ready. I think that very likely they will revolutionize the method of catching sardines. They seem to have better luck catching them than the Jap boats and the packers say that they come in in better shape.

A few of the purse seine boats thought that they would try out the law but found that it did not pay after being convicted several different times. The purse seiners do not blame anyone but themselves for passage of this law, as they will admit that they were asleep at the switch, and did not put up any opposition at the Legislature. It was not a Fish and Game Commission bill, but was sponsored and really put through by the gill net fishermen.

For awhile after the law became effective purse seine boats could be bought pretty cheap, but now since they have found they can do fairly well on the Mexican fishing and can catch sardines, it is a different story.

I believe that the purse seine boat can be used in other ways, such as the long line for gill netting, fishing for albacore off shore at a greater distance than the smaller boats can go, and in fact I think they might be adapted to most any kind of fishing for which the smaller boat is used. Our fishery is now growing into larger type boats and I think the larger boats will eventually displace the smaller ones.—H. B. Nidever.

A CLOSED SEASON FOR NORTHERN HALIBUT.

A closed season has been placed on Pacific coast halibut from November 15th to February 15th, by the International Halibut Commission. Under the order of this commission it is unlawful to catch halibut on the Pacific coast of North America or to land them at any port in the United States or Canada during the closed time. It is provided that halibut caught accidentally while fishing for other fish may be utilized by the crews on the boats for food while at sea but any such halibut on board the fishing boat must be turned over to the federal authorities immediately upon landing.

This order does not apply to the fish known as California halibut or bastard halibut which is a large flounder and not a halibut, but it does apply to the large northern halibut which is occasionally caught by fishermen in northern California waters and by the trawlers operating out of San Francisco.

FROZEN FISH IMPORTED FROM JAPAN.

On January 29th in Sacramento in the Japanese fish markets there were six consignments of fresh fish imported from Japan by four different markets. The fish were semifrozen. One species is known as the snapper. It has a sheepshead head and nose almost milk white in color and weighs about three-fourths of a pound. It sold in the markets for eighty cents a pound. The other species known by the Japanese as a kajouro resembles a barracuda and is almost eleven inches long, very slim and delicate. These sold for seven cents per fish, each weighing less than one-half a pound apiece. As long as I have been on the commission, I have never seen a shipment of fresh fish from Japan.—W. J. Green, Sacramento, California.

CONSERVATION IN OTHER STATES.

MINNESOTA PLANS TO PLANT FINGERLINGS.

The Minnesota department of conservation is rapidly installing ponds in order to rear trout to the fingerling stage before planting. The plans to rear the fish to greater size are being undertaken because of the destructiveness of spring and early summer freshets on fry, and the fact that insufficient natural food exists in the streams in the early part of the season. During the past season it was necessary for two hatcheries to plant fry, owing to the high temperature of the water not permitting their retention to a later stage of growth.

BRITISH COLUMBIA TRIES ACCLIMATIZATION EXPERIMENTS.

According to an item appearing in the *Canadian Field Naturalist*, the Game Conservation Board of British Columbia, in its endeavor to improve game conditions, has introduced the muskrat on Vancouver Island. In the hope that the fur resources of the island may be improved a small number were trapped on the lower mainland and planted in various places. Four mountain goats secured from Banff, Alberta, in January, 1924, have been released in the elk reserve at Cowichan Lake, Vancouver Island. This is the beginning of a determined effort to acclimatize the Rocky Mountain goat on the island.

ILLINOIS NOW HAS DEPARTMENT OF CONSERVATION.

Illinois has added to its state organizations a Department of Conservation charged with the promotion of fishing, hunting, wild-life protection, dissemination of information concerning the industrial phases of wild-life conservation, reforestation and general forestry, and the prevention of pollution in Illinois streams and lakes. The bill provides for a director and an assistant director.—*American Forests and Forest Life.*

CONSERVATION AGENCIES REORGANIZED IN MINNESOTA.

Under a law enacted by the Minnesota legislature last session, a department of conservation becomes one of fourteen departments to replace ninety-three boards, commissions and bureaus.

The new department of conservation includes a commissioner of forestry and fire prevention, a commissioner of game and fish, and the state auditor, who is to be commissioner of lands and timber *ex officio*.

The law provides that the commissioner of forestry and fire prevention shall be chairman of the department, and the governor has appointed State Forester Grover M. Conzet to this position. Mr. Conzet has been state forester for the past two years and has the confidence of the conservation interests of Minnesota.—*American Forests and Forest Life.*

ALABAMA INTRODUCES FORESTRY INTO THE PUBLIC SCHOOLS.

The elements of conservation are to be a required study in the schools of Alabama. Special emphasis will be placed on forestry as a subject.

MINNESOTA GAME DEPARTMENT USES SLED DOGS.

A team of huskies is owned by the State Game and Fish Department of Minnesota, for this is the only possible means of transportation for game wardens during winter weather in the northern part of the state. The team was secured primarily to aid in patrolling the Superior Refuge.

MICHIGAN VIOLATORS PAY HIGH PRICE FOR GAME.

According to a Michigan magazine, five Detroit Italian hunters paid $463 for fourteen song birds they had killed. Each man paid a fifty dollar fine and costs, and their guns and car were confiscated. The seizure of automobiles carrying contraband game is made possible under a new statute. In another instance three hunters paid $900 for killing a fawn doe weighing forty-five pounds. They were charged with killing and possessing deer out of season and with the possession of a headlight with which they "shined" their game. Each paid $100 fine and costs, and the car and rifles seized were valued at $600. Confiscation laws make law enforcement much easier.

LIFE HISTORY NOTES.

A HORNED DOE.

On October 3, 1925, Mr. Roy Bullard of Reedley, Fresno County, killed a mule deer with well developed horns. At an elevation of about nine thousand feet, on the ridge between the middle and south fork of Kings River on the middle fork slope, two deer were seen together. One proved to be a doe with horns and the other taken by Mr. F. A. Bullard proved to be a four point buck. Both animals were in fine condition, and each weighed nearly two hundred pounds, the buck being slightly the largest. The doe had three points and a nineteen-inch spread.

Three instances of horned does being taken have come to the notice of the Fish and Game Commission the past season. This one is apparently the largest on record.

FIG. 12. Four point buck and horned doe of mule deer with I. A. Jones at left and Roy Bullard of Reedley, the killer of the horned doe, at the right. Photograph October 3, 1925, by F. A. Bullard.

In the accompanying photograph the horned doe is seen at the right with Mr. Roy Bullard in the background, and the buck at the left with Mr. I. A. Jones.—F. A. Bullard, Dunlap, Cal.

REPORTS.

FISH CASES.

July, August and September, 1925.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Angling License Act	17	$365 00	
Violations of Commercial Fishing License Act	40	475 00	
Trout: over bag limit	8	195 00	
Trout: closed district	2	100 00	
Striped bass: over bag limit; undersized	40	935 00	
Striped bass: sale, closed season	1	25 00	
Striped bass: spearing	1	100 00	
Salmon: illegal spearing	1	25 00	
Sturgeon: taking, possession	1	25 00	
Crabs: possession, females	1	25 00	
Crabs: closed season	3	100 00	
Clams: over bag limit; undersized	86	2,770 00	100
Abalones: over bag limit; undersized	26	820 00	
Abalones: taking with diving apparatus	1	50 00	
Barracuda: undersized	3	75 00	
Salt water eels: undersized	2	40 00	
Lobsters: closed season	4	80 00	
Fishing within 250 feet of fishways	4	100 00	
Illegal night fishing	1	30 00	
Obstructing streams; failure to maintain fish ladder	5	100 00	
Pollution of streams	1	50 00	
Nets: illegal possession or use	43	2,825 00	
Totals	291	9,310 00	100

GAME CASES.

July, August and September, 1925.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Hunting License Act	47	$630 00	
Deer: hunting, killing, possession, closed season	32	2,115 00	30
Deer: failure to retain skin-horns	11	1,000 00	50
Deer skins: evidence of sex removed	3	125 00	
Deer: over bag limit	1	150 00	
Deer: killing, possession; does, fawn, spike bucks	31	1,700 00	180
Ducks: killing, possession; closed season	17	415 00	2
Geese: killing, possession; closed season	3	75 00	
Mudhens: killing, possession; closed season	1	25 00	
Shorebirds: killing, possession	1	50 00	
Doves: killing, possession; closed season	16	463 00	
Quail: killing, possession; closed season	20	810 00	
Pheasants: killing, possession	1	100 00	
Sage-hens: killing, possession; closed season	1	25 00	
Non game birds: killing, possession	6	50 00	
Bear: killing, possession; closed season	3	50 00	
Squirrel: killing, possession	2	75 00	
Rabbits: cottontail, brush: killing, possession; closed season	13	310 00	
Night hunting	4	90 00	
Trespass	4	160 00	
Game refuge: hunting or possession of firearms	14	275 00	
Totals	234	8,693 00	262

STATEMENT OF INCOME.

For the Period July 1, 1925, to September 30, 1925, of the Seventy-seventh Fiscal Year.

	Detail	Total
License sales:		
Angling	$129,888 00	
Hunting	41,257 00	
Market fishermen's	24,280 00	
Trapping 1925-1926	349 00	
Wholesale fish packers' and shell fish dealers'	895 00	
Game breeders'	15 00	
Fish breeders'	10 00	
Kelp	10 00	
Total license sales		$196,704 00
Other income:		
Court fines	$14,482 00	
Fish packers' tax	3,175 73	
Kelp tax	46	
Fish tag sales	1,866 68	
Game tag sales	21 48	
Sale of beaver hides	10 00	
Sale of nets and lines	186 00	
Abalone inspection	115 50	
Interest on bank deposits	971 46	
Total other income		$20,829 31
Total income		$217,533 31

STATEMENT OF EXPENDITURES.

For the Period July 1, 1925, to September 30, 1925, of the Seventy-seventh Fiscal Year.

Function	Materials and Supplies	Salaries and Wages	Service and Expense	Property and Equipment	Total
Administration:					
Commissioners			$186 68		$186 68
Executive offices	$253 60	$5,331 80	1,678 35	$1,970 41	9,234 16
Printing	484 04				484 04
Research and publicity	21 10	1,345 00	201 63		1,567 73
Accident and death claims			178 94		178 94
Department totals	$758 74	$6,676 80	$2,245 60	$1,970 41	$11,651 55
Commercial fish culture and conservation:					
Superintendence	$46 24	$2,565 00	$794 94	$3 00	$3,409 18
Inspection and patrol	1,224 40	4,911 70	1,267 46		7,403 56
Research	119 94	4,150 67	752 96	68 46	5,092 03
Statistics	247 50	1,681 88	90 05		2,019 43
Propagation and distribution of salmon	3,684 11	3,875 51	355 90	75 61	7,991 13
Department totals	$5,322 19	$17,184 76	$3,261 31	$147 07	$25,915 33
Sporting fish culture:					
Superintendence	$18 52	$2,655 32	$682 33		$3,356 17
Special field investigations	5 55	600 00	329 35		934 90
Printing					
Propagation and distribution of trout	13,145 97	18,402 31	2,349 52	$94 47	33,992 27
Department totals	$13,170 04	$21,657 63	$3,361 20	$94 47	$38,283 34
Patrol and law enforcement:					
Prosecutions and allowances			$42 10		$42 10
General patrol	$2,036 40	$36,433 30	26,696 50	$2 00	65,168 20
Department totals	$2,036 40	$36,433 30	$26,738 60	$2 00	$65,210 30
Fish and game conservation:					
Game bird introduction	$4,930 75	$525 00	$1,410 33		$6,866 08
Printing	20 60				20 60
Game farms	2 30		102 55		104 85
Mountain lion hunting		375 00	133 92		508 92
Mountain lion bounties			760 00		760 00
State fair exhibit	3,148 04	127 50	977 76		4,253 30
Department totals	$8,101 69	$1,027 50	$3,384 56		$12,513 75
License commissions			$5,376 10		$5,376 10
Tahoe camping grounds	$20 05	$656 00	14 93	$0 45	691 43
Grand totals	$29,409 11	$83,635 99	$44,382 30	$2,214 40	$159,641 80

By Fish and Game Commission
Department of Commercial Fisheries

CALIFORNIA FRESH FISHERY PRODUCTS FOR MONTHS OF JULY, AUGUST AND SEPTEMBER, 1925.

Species of Fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Mexican, brought into California via San Pedro	Mexican, brought into California via San Diego	Total Mexican brought into California
Albacore							19,432	61	60,504	4,000	15,755,780	32,729	3,892,218	19,764,724	21	105	126
Anchovies							22,562				6,278			28,840			
Barracuda										20,851	507,108	1,353	122,790	652,105	134,125	225,229	359,354
Blucfish								1,744	10,416					12,160			
Boccaccio	10						9,433	78,553	81,844	1,786				171,626			
Bonito							13	1,538	10	4,399	493,173	1,723	69,049	569,905	4,474	4,459	8,933
Carp				15	314	6,682								7,011			
Catfish		4,741		1,293	18,161	14,242								38,440			
Chilipepper							5,882	33,326	3,025					42,233			
Cultus Cod	12,121	13,411					181,110	30,853	6,351					243 849			
Dolphin																	
Eels							100							100			
Flounders	136						119,298	2,350	307		211	42		122,344			
Grayfish							10,037	400			4,017	174	19,580	34,208			
Greenfish																	
Hake							5,850	2,875						8,725			
Halibut	102,626	40,034	827				3,211	819	3,173	108,364	92,851	265	1,326	353,496	112,926	473,047	585,973
Hardhead																	
Herring							225		11					236			
Kingfish							368	4,941	894		65,205	604	850	72,862			
Mackerel							416	4,173	565,546	9,508	354,546	18,690	44,187	997,066	151	1,876	2,027
Marlin																	
Mullet													3,021	3,021		3,782	3,782
Perch	15,445	60	2,562				16,749	1,229	4,231	221	34,602	930	3,463	79,492			
Pike				4	15	343								362			
Pompano											1,754		32	1,786			
Rock Bass										45	35,080	921	72,328	108 374		91	91
Rockfish	31,356	13,446					192,794	70,590	44,597	13,269	70,883	6,380	232,552	675,867			
Sablefish	11,275						123,604	80,518			80			215,477			
Salmon	2,235,387	406,946		378,081	305,185	1,116,399	425,907	51,312	8,763					4,927,980			
Sandabs							334,810	112,750	316		1,856			449,732			
Sardines							238,954		57,040,825	152	18,592	345	126,283	57,425,151			
Sculpin								52	1,363		142,819	68	1,111	115,413			
Sea Bass—Black											5,741	115	7,867	13,723	258	27,123	27,381
Sea Bass—White			5,801				41,755	5,331	623	34,776	159,776	3,333	28,140	279,535	56,248	538,340	594,588
Sea Trout							75						832	907			
Shad				60	194	3,171	31							3,456			
Shad—Buck					3	327								330			
Shad—Roe					14									14			
Sheepshead										208	3,089	20	334	3,651		410	410
Skates							19,489	5,675			755			25,919			

Skipjack								7,760	32		4,478,290	1,539	2,473,671	6,961,292	653,054	889,724	1,542,778
Smelt	3,290	1 538	5,127			1,015	24,142	76,597	19,247	18,682	44,653	12,642	2,192	209,125	105	498	603
Sole	631	8,007					1,728,932	499,312	2,395	23,525	2,095	1,057		2 265,954	1,785		1,785
Splittail						145								145			
Striped Bass				3,614	1,351	104,211	11,976		57					121,209			
Stingaree																	
Suckers							115							115			
Surf Fish																	
Swordfish											7,040		8,552	15,592		1,283	1,283
Tomcod							6,708	250						6,958			
Trout—Farm																	
Trout—Steelhead	222													222			
Tuna											255,495	550		256,045			
Tuna—Bluefin											3,383,829	556	1,435	3,385,820			
Tuna—Yellowfin											267,215	138	90,399	357,752	857,520	1,613,410	2,470,930
Turbot			198											198			
Whitebait	12,372		2,383				18,504							33,259			
Whitefish											9,937	12	25,301	35,250	180		180
Yellowtail											869,283	470	841,255	1,711,008	26,676	17,690	44,366
Miscellaneous	345					234	5,852	119	2,705	3,061	41,615	456		54,387	1,736		1,736
Total fish	2,425,216	488,183	16,898	383,067	325,240	1,246,769	3,568,334	1,073,128	57,857,238	242,850	27,113,648	85,112	8,068,768	102,894,451	1,849,259	3,797,067	5,646,326
Crustaceans																	
Crabs	[1]25,008						[2]278,664		[3]72					[3]303,744			
Ecrevisse																	
Shrimps			335,261				153,250							488,511			
Spiny Lobsters																	
Mollusks																	
Abalones									880,500	2,496				882,996			
Clams—Cockle																	
Clams—Mixed	1,563	5,599	6,065							445			134	13,806			
Clams—Pismo										93,714				93,714			
Clams—Softshell			22,400			25,692	14,226							62,318			
Cuttlefish		49					4,247	304	19,257	43				23,900			
Limpets																	
Mussels							5,234		1,185	25		950		7,394			
Oysters—Eastern			[2]17,110				[4]119,547							[7]136,657			
Oysters—Native																	
Snails																	
Squid							240		699,523					699,763			
Miscellaneous																	
Frogs (doz.)																	
Terrapins (doz.)																	
Turtles																	
Totals	2,451,787	493,831	397,734	383,067	325,240	1,272,461	4,143,742	1,073,432	59,457,775	339,573	27,113,648	86,062	8,068,902	105,607,254	1,849,259	3,797,067	5,646,326

All amounts shown in pounds unless otherwise specified. Albacore and skipjack cleaned.

[1] 1042 dozen.
[2] 77,775 shell oysters.
[3] 11,611 dozen.
[4] 543,400 shell oysters.
[5] 3 dozen.
[6] 12,656 dozen.
[7] 621,175 shell oysters.

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45140

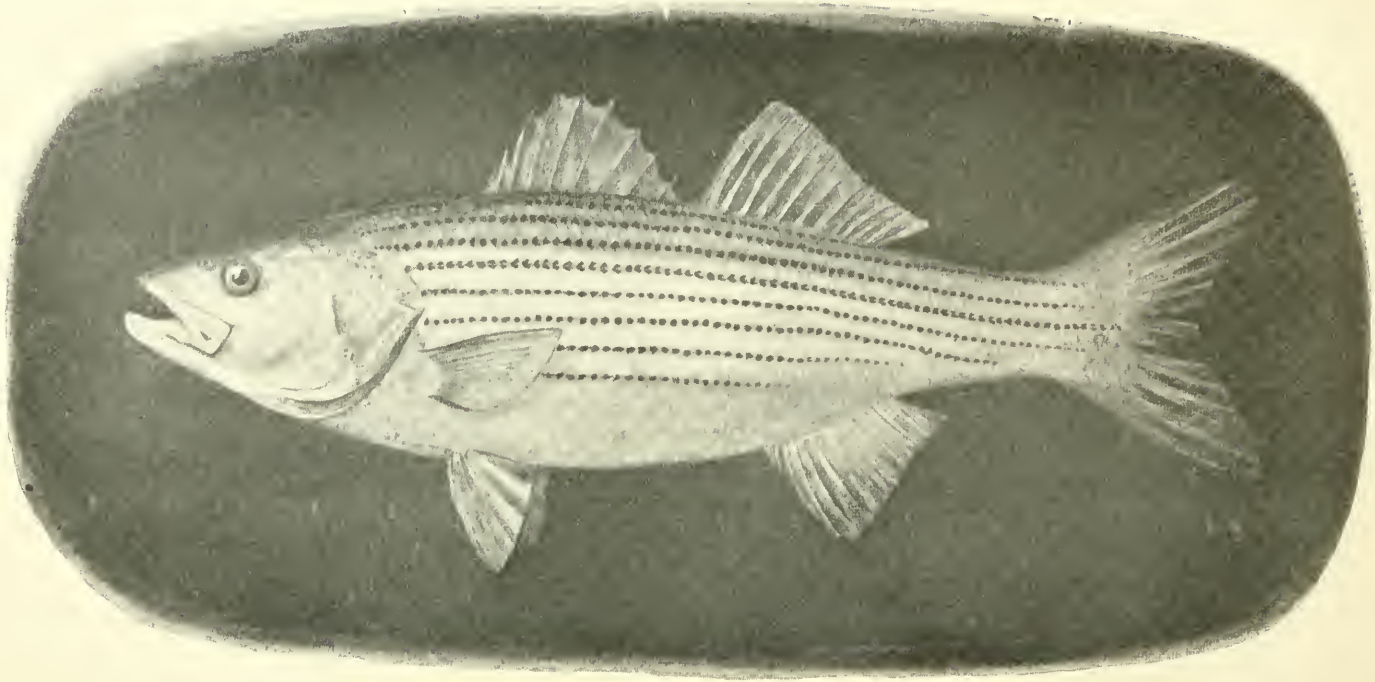

FIG. 13. Striped bass (*Roccos lineatus*) introduced into California in 1879 and now a notable food and game fish.

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 12 SACRAMENTO, APRIL, 1926 Number 2

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THE STRIPED BASS IN CALIFORNIA.

By N. B. Scofield and H. C. Bryant.

To develop a fishery which has been known to yield over 1,750,000 pounds valued at a half million dollars annually, with an original outlay of less than a thousand dollars, to say nothing of continuous, superb sport and valuable food furnished the anglers of the state, is an accomplishment that merits review. The striped bass, originally native to the Atlantic seaboard, is now a common food and game fish of California, the basis of a great fishery, and so highly prized by anglers that numerous bass clubs find existence in the cities and bass fishing enthusiasts line the banks of sloughs whenever this fish is pro-

curable. Unquestionably, next to trout, the striped bass is the most popular game fish of northern California.

Roccus linneatus, although known commonly as striped bass, is in reality not a true bass, nor is it a true perch, though possibly related to both. Most ichthyologists consider it a transitional type between the perch and the sea bass. Among fishermen, especially in the south, the fish has long been dubbed "rock fish."

Geographical Distribution.

The original distribution of the striped bass or "rock fish" included the Atlantic coast from the Gulf of St. Lawrence to northern Florida, with a few more or less authentic records of its occurrence in the Gulf of Mexico. As indicated by the fisheries, its present centers of abundance lie between Cape Cod and North Carolina, where it ascends all suitable rivers to spawn and in the pursuit of food. According to tradition, many years ago it was very abundant on the New England coast, north of Cape Cod, in the Bay of Fundy, on the Coast of Nova Scotia and gulf coast of New Brunswick. In the United States north of Cape Cod, it is now comparatively rare. Although formerly known to ascend the St. Lawrence in large numbers, some of them as far as Quebec, this fish is now very scarce in that river. In the early nineties, the striped bass was most abundant in the Chesapeake and Delaware Bay region and in the waters of New York and southern New England.

Plantings of Striped Bass in California.

1879—135 from New Jersey, near Martinez.
1882—300 from New Jersey, Suisun Bay near Army Point.
1899—Less than dozen, Humboldt Bay.
1903—75 (size, 2 to 3½ lbs.), Brackish lagoons of Orange County, mouth of Santa Ana River.
1905—80 (5 to 8-inch fish), Brackish lake at Crescent City, Del Norte County.
1909—Car load (6 in. to 4 lbs.), North Santa Ana River, Orange County.
1916—1800, North San Diego River, San Diego County.
1916—2000, Morro Bay, San Luis Obispo County.
1919—1500, Bolsa Chica, Orange County.
1919—1500, Morro Bay, San Luis Obispo County.

Introduction Into California.

"The striped bass was first introduced into the waters of the Pacific slope in 1879, at the same time that a consignment of eastern lobsters was taken across the continent. The acclimatization of this species was undertaken at the suggestion of Mr. S. R. Throckmorton, then chairman of the California Fish Commission * * *.

"In July, 1879, Mr. Livingston Stone, of the United States Fish Commission, made a collection of living striped bass in the Naveesink River, New Jersey, for transportation to California. He obtained 132 fish from 1½ to 3 inches long and 30 medium-sized specimens. Twenty-five of these died during transportation and several were thrown away, but the remainder, about 135, reached California in good condition and were deposited in Carquinez Strait at Martinez.

"The second and only other plant of striped bass in California waters was made in 1882, when Mr. J. G. Woodbury of the California Fish Commission carried about 300 fish, 5 to 9 inches long, from the Shrewsbury River, New Jersey to Suisun Bay, where they were deposited at Army Point, about 3 miles from the preceding plant." (Smith, 1896.)

Increase in size was noticeable in the catches of succeeding years. In September, 1883, a 17-pound striped bass was taken at Monterey Bay. The following month a 16-pound fish was caught in the Sacramento River. On March 11, 1884, an 18½-pounder was offered for sale in the San Francisco market. Ten years after planting, on June 16, 1889, a 45-pound striped bass was sold on the San Francisco market. (Smith, 1896.)

In 1889, hundreds of them weighing from one-half to a pound each, were being caught and sold in the San Francisco markets. From 1889 to 1892, the number caught had increased 250 per cent. After 1900 they were occasionally taken in tributary streams. Previous to 1903 striped bass weighing twelve pounds were taken in the Feather River near Oroville and were numerous in the Tuolumne River above Modesto in the Stanislaus and in the Merced and San Joaquin rivers. In the Sacramento River striped bass have been taken as far north as Kennett.

For many years there was no great extension of range along the coast. Striped bass were limited largely to the Sacramento and San Joaquin rivers, with occasional specimens being taken from Monterey Bay northward as far as the mouth of Russian River in Sonoma County. By 1896 it was fairly abundant in the mouth of Salinas River; a few years later it was taken in the coastal streams of Oregon, and in the fall of 1906, a half dozen specimens were secured by the U. S. Bureau of Fisheries in traps at the mouth of the Columbia River. (Smith, 1910.)

In 1925 striped bass were being caught in commercial quantities in the Coos Bay region, Oregon, and dealers at Big Bend, Oregon, were looking for a market for these fish in California.

Considering the small number of fish introduced and their remarkable increase in a few years, the result obtained from the introduction of the striped bass into California is one of the greatest feats of acclimatization of new species of fish in the history of fisheulture.

Additional Transplantation.

Desirous of furnishing the northern coast countries with this most desirable food fish an attempt was made in 1899 to introduce the striped bass into the streams entering Humboldt Bay. Most of the shipment died en route and less than a dozen were actually planted. Whether or not this plant was successful is not known, but three or four specimens were secured in the Eel River ranging as high as twenty pounds in weight in 1907, and an occasional bass is taken in Klamath River to the north.

In 1903 seventy-five bass six inches to three and one-half pounds in weight were planted in brackish lagoons at the mouth of the Santa Ana River in Orange County. Another plant was made the following year. Finally a carload of striped bass ranging in size from six inches to four pounds in weight was collected in 1909 in the Straits of Carquinez, at Port Costa, within two miles of where the original plant of bass was made twenty-seven years ago and transported without loss of a single fish to southern California, where they were distributed in suitable waters of limited area in Orange County. This third shipment made into these waters within eight years was expected to determine beyond all question their adaptability to the conditions found there.

On October 26, 1916, eighteen hundred small striped bass were planted near the mouth of San Diego River by the Fish and Game Commission,

and since that time small striped bass have on several occasions been observed near the place of planting.

Mr. A. G. Pearson of San Diego reported that on or about June 20, 1919, he took several small striped bass ranging from five to eight inches in length in San Diego River near its outlet into Mission Bay.

The fry at the time of planting were between two and three inches long, being fish of the year, spawned in April or May, 1916. If these fry had grown at the rate they do in San Francisco Bay they would have reached the size of five to eight inches in 1917, during their second year. If the fry reported by Mr. Pearson were some of the fry liberated in 1916 they were in their fourth year and their rate of growth had been remarkably slow. It was suggested that these five to eight-inch fish were the progeny of the fish planted in 1916, but that can

FIG. 14. Catch of striped bass on Salinas River June 9, 1921. Five of these fish weighed 15 pounds or over. The fishermen are G. O. Clark, E. W. Smutz, and Douglas Hollingworth of Watsonville. Photograph by G. A. Clark.

hardly be, as a sufficient length of time had not elapsed. It is pretty certain that striped bass do not spawn earlier than their fourth year, and the fish planted in 1916 would not have completed their fourth year until the spring of 1920. It would seem more probable that other striped bass plants have been made of which we have no record, or else that striped bass have strayed to the south and occasionally spawn as far south as San Diego.

In the same year a plant was made in Morro Bay. Again in 1919 5000 small striped bass were secured in the Sacramento River and 2500 shipped in the fish car of the Fish and Game Commission to Morro Bay, San Luis Obispo County, and 2500 to Bolsa Chica, Orange County.

On Saturday, November 15, 1919, the California Fish and Game Commission shipped about 2500 striped bass from two and one-half to five inches in length to the Fish and Game Commission of the Territory

of Hawaii to be planted in streams in the vicinity of Honolulu. The fish were caught in a seine on the Benicia flats, held in live cars until sufficient were collected to make the shipment, and then were put aboard the Matson Navigation Company's steamer *Maui*. Here the fish were distributed in six large salmon tierces that had been arranged on the main upper deck in from the office of the chief engineer, who took personal charge of them.

Life History and Habits.

Although known to be an anadromous fish, the striped bass is to be found in the San Francisco Bay region or in the lower Sacramento or San Joaquin rivers in varying numbers in any month of the year. In the lower rivers, however, more of them are caught in the spring and autumn.

Two distinct migrations take place. In the spring of the year, beginning during March and extending through April, May and part of June, the spawning migration of striped bass takes place. They come from the deeper holes in the lower rivers and bays, also from the ocean, and run well up the Sacramento and San Joaquin rivers and some of the smaller tributaries like Napa River. This run consists mainly of large bass. The average weight of these fish was formerly between twelve and fifteen pounds. Thirty-pound fish were common, and occasionally fifty and sixty-pound fish were caught. At present fewer large fish are taken and the average weight is less.

In the fall of the year the run of what is known as "winter bass" takes place. These fish average much smaller. They come into the bays, run into the sloughs and for some distance up the rivers for the purpose of feeding. Some of these bass may be with spawn, but the eggs probably are not deposited until after March when the water temperature gets above sixty degrees. This fall run commences usually in September, the time being somewhat variable, and lasts from two weeks to two months. The fish of this run are often immature bass, not often over five or six pounds, and according to the fishermen, are bright and fresh from the sea. The small sized bass are more apt to be found in schools than the large fish, and the large catches in gill nets are usually of this size. This is particularly true of catches in gill nets in the lower bays. In the lower bays they are often found on the flats voraciously feeding on schools of small fish, making a sucking noise similar to that of the carp when feeding at the surface of the water. Often a school of these bass will run into one of the numerous tule-lined sloughs of the Sacramento and San Joaquin deltas, evidently attracted by the small river fish which they drive before them, feeding as they go. Such schools are often indicated by a large number of shags, gulls and fishing birds which take this advantage to feed upon the maimed and frightened fish. Several years ago commercial fishermen would look for these bass schools in the sloughs and would occasionally make catches so large they could not take all in their boat and would have to put some on the bank and come back later for them. But these catches are no longer made, for in 1915 the legislature passed laws which closed the sloughs to commercial fishing.

Striped bass during these two runs or at any other time seem to be quite notional. They will suddenly appear on the river fishing drifts and as suddenly disappear again, and no trace of them can be found. Commercial fishermen who have had fifteen or twenty years' experience

fishing for them in these waters still trust mostly to chance in locating them, not being able to figure out their movements other than that rough water spoils the fishing, the theory being that they leave the flats and sloughs in rough weather and take to the deeper parts of the river where the nets do not reach them.

Nearly twenty years ago when an attempt was made in California to artificially propagate striped bass, most of the large "spawn" bass were being caught on the San Joaquin River near Bouldin Island. But this is now changed, and although there is a spawning migration of bass in the lower San Joaquin River, the larger run is now in the Sacramento River and were caught in nets as far up as the mouth of Feather River until netting was prohibited above the bridge at Sacramento by the legislature in 1925. After spawning they ascend the rivers for long distances, or enter the sloughs or flooded lands in search of food, for after spawning they again become voracious feeders.

In the years 1903, 1904 and 1905 spawn bass were so plentiful about Bouldin Island that the fishermen, in order not to glut the market, agreed among themselves to catch no more than 600 pounds to the boat each twenty-four hours. They frequently got more than double this amount at one drift of a gill net.

Many of these fish were with mature eggs and the fishermen all testify that the bottoms of their fish lockers were covered with eggs. The main spawning season is between the middle of April and the middle of June. The spawning migration commences in the bay and lower river a month earlier than this.

SPAWNING.

"The striped bass spawns in the late spring and early summer, ascending rivers and their tributaries for the purpose. The principal streams on the Atlantic coast of the United States are those flowing into Albermarle Sound, Chesapeake Bay and New York Bay. From North Carolina to New Jersey the spawning time appears to be in late April and early May; farther north, in late May and June. * * *

"An observer described some of the breeding habits of the fish to the effect that when a female was in spawning condition the males gathered about her in great numbers. A single female which might weigh from five to fifty pounds would have around her twenty, thirty or fifty small male fish, all of which weighed less than two pounds each, and they seemed to be the only males present. The water was stated to be discolored with blood from the fish 'finning' one another while contending for the female." (U. S. Bur. of Fisheries Memorandum.)

The eggs of the striped bass are about one-twentieth of an inch in diameter, produced in large numbers. In spawning operations at Bouldin Island, California, 20,000 to 500,000 eggs were secured from ripe females. Two females spawned produced 1,000,000 eggs each. According to a report a twenty-pound female in the east has produced 1,500,000 eggs estimated on the basis of 25,000 to a quart.

Convinced of the advisability of attempting to increase the supply by artificial propagation, an investigation of hatchery sites was begun by the California Fish and Game Commission in 1907. The funds at that time being insufficient to bear the expense unaided, the subject was

taken up with the United States Bureau of Fisheries at Washington, with the result that Capt. G. H. Lambson, in charge of the salmon hatching work of the Federal Bureau of Fisheries in California, was instructed to cooperate. Accordingly, in the month of May, 1907, operations were commenced at Bouldin Island, on the San Joaquin River, at which point a small hatchery building was constructed at the expense of the commission. A small pumping plant for the purpose of raising water into two tanks of 2000 gallons each to furnish the necessary amount of water for hatching operations was also in-

FIG. 15. Three striped bass caught by trolling in Salinas River July 9, 1921, by Douglas Hollingworth of Watsonville. The fish weighed 12, 14 and 17 pounds respectively. Photograph by G. A. Clark.

stalled. The equipment of the hatchery, McDonald hatching jars, was furnished by the United States Bureau of Fisheries. The hatchery depended on the commercial fishermen for any ripe eggs they might take.

Although fishermen took a lively interest and assisted in every way, yet the results were unsatisfactory. It was found that by the same methods followed in "stripping" trout and salmon, the eggs and milt

could be taken from striped bass, and yet neither the eggs nor milt be sufficiently matured to insure fertilization. The result was many eggs were taken that were apparently ripe, but whose fertility could not be definitely determined until after the eggs were placed in the hatchery. The total take of eggs for the first year's operations was about eighteen million, about three times the amount taken up to that time on the Atlantic coast in a single season of which there is any record. The percentage fertilized and hatched, however, was small. From many lots of eggs no fish hatched. Other lots hatched 5 per cent only, and from that up to 50 and 60 per cent. One lot hatched a very high percentage of the eggs.

Nevertheless, the results of the season's work were encouraging, for hatching striped bass was still in the experimental stage, and the results in number of eggs hatched during the season of 1907 were much better than had been obtained on the Atlantic coast. It was not determined just why so many eggs failed to hatch, but it was laid to unsuitable water or some defect in hatchery method.

The season of 1908 found the hatchery better prepared for work and equipped with microscopes and apparatus for determining the cause of the failure of so many eggs to hatch. This season the run of bass was almost a failure, and the take of eggs so small that many of the experiments came to nothing for lack of eggs with which to experiment.

It was soon found that the first cleavage of the germinal disc in the developing egg takes place about two hours after fertilization. So with the microscope it was possible to tell within two hours after the eggs were taken just what per cent was fertilized and developing. It was found also that the loss of eggs was not due to bad water or any defective method of handling the eggs in the hatchery, but due to the nonfertilization of the eggs. That fungus could be established through the use of copper sulphate 1-500,000 parts was demonstrated.

Hatching takes place about three days after impregnation. The yolk-sac is not entirely absorbed until after the seventh day, and the stomach is not well developed until about the thirteenth day.

Young fry were kept for two weeks in McDonald hatching jars by removing the siphon tubes and replacing the top with silk bolting cloth, allowing a small stream of water to flow on the cloth.

Artificial propagation was finally abandoned after further discouraging work in the seasons of 1909 and 1910, when few ripe females were obtainable.

RATE OF GROWTH.

"The rate of growth is very rapid. Young fish an inch long found in the Delaware River in the second week of June, about the middle of October were observed to have grown to the length of four and one-half inches. Young fish five to nine inches in length, which are taken in quantities in the Potomac in February and March, are supposed to be the young of the previous year.

"The striped bass has been kept in a small pond of fresh water and fed upon crabs and oysters, increasing in about eleven months from six to twenty inches in length. It is stated that in a Rhode Island pond a bass weighing one-half to one pound in June increased to a weight of

six pounds in the following October." (U. S. Bur. Fisheries Memorandum.)

SIZE ATTAINED.

According to the U. S. Bureau of Fisheries, the largest striped bass records are of several taken at Edenton, North Carolina, each of which weighed 125 pounds. One taken at Orleans, Massachusetts, weighed 112 pounds. Such a fish would measure at least six feet in length.

FIG. 16. A striped bass weighing 62½ pounds caught in the Napa River by William West September 11, 1911. This is the largest fish recorded for the Napa River. Photograph by William West.

Individuals of 60 and 70 pounds are not uncommon, although the average is probably not over four or five pounds.

Mr. George Neale, former executive officer of the Fish and Game Commission, saw and weighed a striped bass in a San Francisco market that tipped the scales at 78 pounds. The dealer told him that two days before he had one weighing 82 pounds. This was about 1910.

The fish shown in the accompanying photograph, the largest bass ever caught in Napa River by hook and line, was taken by William

West September 11, 1911. This fish weighed 62½ pounds and was taken on a 7B Wilson spoon, all copper.

Another bass caught in Napa River February 27, 1925, by A. C. Doble weighed 44 pounds and measured 49 inches by 29 inches in girth.

In November, 1924, Messrs. Johnson and Kelly, using live suckers as bait, caught two bass weighing 32 and 54 pounds each, respectively, in the Russian River near Monte Rio. Mr. Jim Cahill of Sebastopol secured a 57-pound striped bass in Forest Pool on the Russian River in October, 1924. Several 40 and 45-pound bass were taken in the same river during the season of 1925.

There are many unverified statements as to the size of striped bass caught years ago when larger ones were taken more often.

Fish weighing less than three pounds (now size limit of 20 inches) are protected the year round in California, and fish of more than ten pounds in weight can not be taken during the spawning season.

HABITS.

"The striped bass, although migratory and anadromous, does not cover great distances nor spend much of its life in the ocean as does the salmon, for it may be found in the range throughout the year. It may be taken in salt, brackish or fresh water, even being kept in artificial ponds of fresh water for considerable lengths of time without detriment." (U. S. Bur. Fisheries Memorandum.)

Young fish apparently feed in shallow water, for they are often found in overflow areas and must be rescued when these areas dry up in the fall. Many young fish also feed in San Francisco Bay, for a bay with rivers entering it is always a nursery for young fish. Where there is an intermingling of fresh and salt water, as in the upper San Francisco Bay, there is a prodigal growth of small animal life, including shrimps and other species of small crustaceans. Upon this small life the young fishes feed.

When Chinese shrimp fishing was allowed in upper San Francisco Bay, large numbers of small striped bass were killed in the nets during winter months. The boats which fished below San Pablo Bay in the deeper water near Red Rock and the stone quarry on the opposite side caught smaller quantities of young fish than those above in San Pablo Bay, but they caught more of the young striped bass than any others.

There is evidence to believe that in the late fall and winter the young bass of the year which have reached a length of from three to five inches abandon the shallow water of the "flats" and move into the deeper water of the channels and thence pass out into the ocean where they spread up and down the coast for a short distance. During the spring young bass of this size appear in numbers in the shallow waters of the inner lagoon of Drakes Bay and in the shallows at the head of Tomales Bay. To the south they appear in Elkhorn Slough, but these may be the result of bass spawning in Salinas River. We know of no proof that striped bass spawn in Salinas River. It is believed that no spawning takes place in either Drakes Bay or Tomales Bay or the fresh water tributaries and that the young bass appearing there come from San Francisco Bay. It is known that the young bass of the year are plentiful in San Francisco and upper bays until the cold of winter comes on. In collecting the young bass for transplanting small meshed

seines are used, and experience in getting these fish for shipment has taught us that the best time to get them in numbers is in the fall before cold weather sets in, and that after cold weather sets in it is about impossible to find enough to make a shipment. The fact that the shrimp nets formerly set on either side of the straits between San Pablo and San Francisco bays in about 30 feet of water caught considerable numbers of young striped bass of the year while they were drifting out on the ebb tide is the best of evidence that there is a seaward migration of the young bass in the fall and winter. It is not likely that these young bass which pass out to sea return for at least a year. Investigations on the age and rate of growth of striped bass in the San Francisco Bay region now being carried on by the commission is likely to throw much light on these questions. Already it is fairly well shown from a study of the scale growth to determine age, that a large proportion of the bass studied passed out of fresh water in the fall and made a large sea growth during their second year. A smaller number remain until the second winter before migrating to the sea and these make their large sea growth in their third year.

Many of these fish were with mature eggs, and the fishermen all testify that the bottoms of their fish lockers were covered with eggs. The main spawning season is between the middle of April and the middle of June. The spawning migration commences in the bay and lower rivers a month earlier than this.

Striped bass occasionally reach fresh water at the headwaters of streams in their spawning migration. Two fish weighing five and six pounds, respectively, were taken in Dry Creek, a tributary of the Napa River, during the spring of 1925. This species is known as far up the Sacramento River as Redding and up the San Joaquin as far as Mendota dam.

In 1914, according to W. P. West of Napa, a bass was speared near Calistoga, 27 miles from tidewater. Fish have frequently been seen above the Trancas dam just above tidewater, but in distinctly fresh water pools. They appeared to be in a very excited state of mind, moving swiftly around as if looking for a way out. This dam consists of six fish ladders with a rise of at least 12 feet, the water in the ladders being very swift. The fish must necessarily jump to get up. When the fish are found above this dam they will not touch any bait no matter what is offered.

Every fisherman knows that striped bass are very sporadic in their occurrence and that in a place where large catches have been made one day the fish are not to be found the next day. Supposedly the same school of fish remain in the same pools to feed each day, even though there may be a daily migration with the tides. Inability to catch fish with hook and line is not always an indication of "no fish," but may be only an indication that they are not feeding. The movements of striped bass in a stream are not definitely known and much is still to be learned regarding feeding preferences.

FOOD.

The striped bass is reputed to be a voracious fish preying largely upon smaller fishes, and is particularly abundant at the time of the spring runs of shad and alewives or river herring. At this season

it is well fed and plump. To some extent it frequents the rocky shores and beaches of bays and sounds at high tide in search of crabs, shrimp and other food, and, at the mouths of creeks, smaller individuals lie in wait for the schools of small fishes and crustaceans which supply them with food. It also subsists upon mollusks, sea worms, etc. (U. S. Bur. Fisheries Memorandum.)

FIG. 17. A striped bass caught February 27, 1925, in the Napa River by A. C. Dobbs. The fish weighed 44 pounds, had a length of 49 inches and a girth of 29 inches. Photograph by Ed Bowen.

FOOD OF ADULT STRIPED BASS IN CALIFORNIA.

The food of the adult striped bass in the rivers is principally carp, hardheads and split-tails. Nearly all the fishermen claim that when the carp is plentiful it is their principal food. They even advance the theory that the bass are not so numerous in the San Joaquin because the carp are not so plentiful on the lower river as they were, and they run up the Sacramento because of their great abundance in those waters.

An investigator for the United States Bureau of Fisheries in 1894 reported that seven out of every ten striped bass examined in California contained carp. Carp even as large as two pounds have been found in stomachs. In spite of this evidence there are many who believe that live carp are not taken if other small scaled fishes are obtainable.

In the stomachs of bass W. P. West of Napa has found crabs, minnows 6 inches long, clams, duck entrails and sardines. Crabs and small fish appear to be the favorite food of bass in the Napa River.

Fishermen have occasionally found a dead striped bass with a catfish caught in its throat by the spines. Catfish weighing up to two pounds appear to be a common item in the diet in the sloughs.

FOOD OF YOUNG STRIPED BASS IN CALIFORNIA.

An examination of the stomachs of fifty young bass averaging three inches in length which were taken at "Morrison's Bight" in Napa Creek on September 10, 1908, showed the following contents: Crustaceans, a species of *Mysis*, 30 per cent; of young shrimp, 15 per cent; of a species of *Gammarus*, 1 per cent; of an isopod, 1 per cent, and 1 small crab; marine worms or annelids, a species of *Nereis*, 45 per cent; of species not recognizable, 5 per cent; small fish, species not recognizable, 2 per cent.

It will, therefore, be seen that on this feeding ground at least, marine worms comprise 50 per cent of the food, crustaceans of marine species 48 per cent, and small fish only 2 per cent. The young shrimp and young fish were taken from the stomachs of young bass of three to four inches in length and the other small crustaceans from the stomachs of specimens three inches and under in length, showing that the young bass begin feeding on the small species of crustaceans and worms, and as they grow in size are able to take the shrimp and young fish.

COMMERCIAL VALUE.

While the striped bass in California has come to be best known by the general public for its value as a game fish it is at the same time a very valuable commercial food fish and in the markets is prized next to salmon. The annual commercial catch of striped bass in California is near one million pounds and this amount is conserved in the state for under our state laws it can not be exported from the state. The amount of bass caught by anglers and used for food each year is hard to estimate but it probably would raise the total bass catch in the state to one million pounds.

"According to the Census Report of 1908, the striped bass fishery of the United States then amounted to 3,657,000 pounds, valued at $314,000, the Atlantic coast fishery exceeding that of the Pacific coast by only 105,000 pounds with a value of $45,000.

"On the Atlantic coast, Maryland, Virginia and North Carolina are paramount striped bass states, of which, according to the 1908 census, in order of pounds of fish caught, Maryland was first with 640,000 pounds, valued at $65,000; North Carolina second, with 510,000 pounds, valued at $36,000; Virginia third, with 502,000 pounds, valued at $46,000. Of the remaining Middle Atlantic states, New Jersey and Delaware show the largest quantity—53,000 pounds each—valued at $7,400 and $7,300, respectively, followed by New York with 32,000

pounds, valued at $5,300, and Pennsylvania with only 7,200 pounds, valued at $800." (U. S. Bur. Fisheries Memorandum.)

On the Pacific coast, California is the only state with a striped bass fishery. During the eighties it commanded a high price even selling for $1 a pound. However, by 1890, the striped bass was so well acclimated that it had become a well known market fish and sold for a less price than those marketed within its natural habitat in the east. In 1893 the San Francisco markets received only 79,738 pounds, but three years later this amount was increased to 363,747 pounds. In 1895 the price dropped to as low as six cents per pound. By 1899 this market was receiving nearly a million and a quarter pounds which brought the fishermen $61,814. In 1904 1,570,404 pounds were landed at San Francisco for which the fishermen received $92,116.

The 1908 census gave California 1,776,000 pounds, valued at $135,000, and the 1915 statistical bulletin of the Bureau of Fisheries shows 1,784,448 pounds, valued at $146,928.

With rigid restrictions relative to season and size limit in recent years (1916–1923), the fishery continues to yield from 600,000 to 1,500,000 pounds annually. At retail this fish sells for about 35 cents a pound.

The principal market catch is secured by gill net fishermen mainly from upper San Francisco bays and the lower Sacramento and San Joaquin rivers. A few are caught commercially with hook and line.

PROTECTIVE LEGISLATION.

Doubtless protective measures are largely responsible for the continued supply of this splendid food and game fish. As early as 1889 it was feared that the recently introduced striped bass were being exterminated before they had come to maturity and had a chance to reproduce. A county ordinance in San Francisco was accordingly passed prohibiting the sale of striped bass under eight pounds in weight. Later it was made unlawful to take bass under one pound, this limit being raised to three pounds in succeeding years.

By 1909 it was believed that additional protection was necessary as the intensity of the fishing was increasing owing to a large export trade and high prices. Accordingly, a nonexport law was enacted. This law was deemed advisable in spite of the fact that a closed season for commercial fishing had been declared during the spawning season in May or June.

The closed season did very little good for the reason that the season for salmon and shad was open at the same time and as each of those fish are running at that time large numbers of bass were killed in the nets and thrown away.

The striped bass conservation problem is a complicated one. During the spring spawning migration of striped bass we also have in the Sacramento and San Joaquin rivers shad and salmon which are also running up for the purpose of spawning. The shad are running during the latter part of March, through April, May, and into June. Salmon are running during this time and until October. The only time during which shad may be taken in commercial quantities is during this migration, and the main fishing grounds are in Suisun Bay and the lower rivers. Shad can not be caught without catching bass at the same time and it is extremely difficult to so regulate salmon fishing that striped

bass will not be caught at the same time. If nets are used for salmon or shad while striped bass are running, striped bass will surely be caught. If gill nets with meshes less than eight and one-half inches be prohibited so as to permit salmon fishing, the catch of bass is light, but the fishermen are not able to take shad as they are taken with meshes measuring from five and one-half inches to six and one-half inches. To prohibit nets with meshes less than eight and one-half inches during the entire shad run would be entirely too severe.

LEGAL PROTECTION.

Laws now provide against the shipment of striped bass out of the state; prohibit the sale or shipment of striped bass formerly less than three pounds in weight, now a size limit of twenty inches; the sale of striped bass of ten pounds or over in weight between March 1st and May 31st; the sale of striped bass of any size between May 16th and July 31st, or between September 17th and November 14h; the taking or having in possession at any time of any striped bass of less than twelve inches in length; the taking within Disricts 1, 2 and 3 of more than five striped bass per day; with provision against sale; the taking of striped bass between one hour after sunset or one hour before sunrise, or in nets on Saturday and Sunday; and the use of nets with a mesh smaller than five and one-half inches.

A law prohibits the use of nets with meshes measuring between five and five-eighths inches and seven and one-half inches in San Francisco and San Pablo bays, between March 1st and July 31st. This measure adopted to prevent shad fishing in these waters is a splendid protection to the striped bass spawning run through those bays. Besides this, fully 1000 miles of sloughs in the San Francisco Bay region have been closed to commercial striped bass fishing. The Sacramento River has been closed to commercial fishing above the city of Sacramento and the San Joaquin River has been closed above the Santa Fe railroad bridge in San Joaquin County. As a concession to the angler, a person may have in his possession in any one calendar day, not to exceed five striped bass between twelve and twenty-one inches in length, but such striped bass must be caught only with hook and line and must not be bought, sold or offered for sale.

It can be seen, therefore, that careful protection has been given striped bass in California, in fact, much greater protection than has been afforded in eastern states. Protection of spawning fish, closed seasons, size limit and limited sale, all contribute to the safeguarding of this valuable fish.

STRIPED BASS DECREASING.

For many years depletion has been evident in eastern states. For instance the 1920 season's catch of striped bass for the state of New York was only 24,437 pounds. The catch in California during the same period amounted to 671,731 pounds. In California there is also a decrease in catch. The annual commercial catch of striped bass shows a decrease of about 50 per cent since 1915.

If we are to use the commercial catch as an index of the abundance of bass we should be sure that we take account of all factors affecting the catch. If the fishing area, the seasons, netting restrictions and

fishing methods remain the same and still the catch falls off, then we can be quite sure that the bass are becoming less abundant, although we can not be sure whether it is the commercial fishing, water pollution, loss of too many spawners or unfavorable spawning conditions that are causing the decrease. But to be on the safe side we should consider commercial fishing the main cause.

On the other hand if fishing areas have been reduced, closed seasons established or restriction placed upon nets, it can not be rightly argued that the decreased catch means decreased abundance of bass. In the case of our striped bass the fishing area was greatly reduced in 1915, and several sloughs and rivers were closed before that. Closed seasons have been established and netting restrictions have been adopted which have made it unprofitable for fishermen to operate in San Pablo Bay during the spring spawning migration. It was to be expected that the catch would fall off. The fishing restrictions were enacted for the purpose of reducing the catch and if the reduced catch shows anything it shows that the restrictions were effective and that the bass are getting the protection they need and it is totally unfair to use the reduced catch as an argument that the bass are being exterminated.

If the fishing restrictions adopted are sufficient, the catch should, after a time, remain the same or even increase. The length of time it would take to show the benefit of the protection would depend upon the age at which the protected fish matured and spawned. Along this line it is interesting to note that, in spite of added protection given by our legislature in 1921 and 1923, the commercial striped bass catch in 1922 showed an increase of 84,000 pounds over the preceding year, and each year since has shown an increase in the catch.

However, along with this decrease in the commercial catch prior to 1922 was a decided scarcity of bass in many of the haunts where both anglers and commercial fishermen formerly found them abundant. The present scarcity is most noticeable in most parts of San Pablo Bay and in the mouths of sloughs tributary to it. On the other hand, striped bass are apparently more plentiful in some other places, and good angling has been enjoyed in places where they had been caught only in very limited numbers before. There are some ardent striped bass anglers who believe that these fish are just as plentiful as they ever were. They believe that some of the sloughs have been fished out by anglers, but that in some cases the bass have moved from their old haunts and have to be sought in other places. Some of the commercial fishermen say that the bass are about as numerous as ever but that they have moved, and that the best net fishing is to be found in places where the bass were formerly not so abundant.

Some commercial fishermen believe that striped bass are not so abundant as formerly.

Most bass anglers are firmly of the opinion that the bass are not only less plentiful but that they are on the road to extermination. Typical of the arguments advanced is the following:

"Great spawning grounds of the striped bass are located in the middle channel of the San Joaquin River. Large fish with a great accumulation of eggs are found there. Formerly as high as 1000 to 2000 pounds of large spawning striped bass would be taken there with nets at one time. In 1907 one angler took 39 fish weighing from 12 to

36 pounds. Now from 75 to 80 per cent of those taken run from two to five pounds in weight."

In spite of discouraging reports good seasons come. The year 1924 was an especially fine season for the angler of striped bass. The average price in the market continues to be 35 cents per pound.

It is our belief after reviewing all the evidence that striped bass are not so plentiful as they were. Large sized "spawn" bass are less abundant than they were, which is a pretty sure sign of over-fishing. But the increase in the catch of bass beginning with the year 1922 in spite of added fishing restrictions of 1921 and 1923 is the best of evidence that the bass are becoming more plentiful and that the effect of the fishing restrictions adopted began to show first in 1922 and that there is now a steady increase in the number of striped bass. It should not be argued that the falling off of the commercial catch prior to 1922 shows that the bass were being fished out by the nets and that there were less than half as many bass as in 1915. It is very much more likely that the 50 per cent decrease in the commercial catch was almost entirely due to the very good restrictive legislation which has been obtained through the efforts of the Fish and Game Commission's efficient enforcement of the protective laws.

The usual method of protecting fish against overfishing is to restrict the catch, and when efficient protective measures are adopted and enforced the resulting decrease in the catch should not be used as evidence that the fish are being exterminated. The scarcity of bass in some of their old haunts about San Pablo Bay we believe is largely due to the bass moving to other regions. This movement is caused mainly by the pollution of San Pablo Bay waters by the government's dredging operations about Mare Island and in dredging the channel from Mare Island to Pinole Point. Much dredging has also been done about the mouths of the more important sloughs. The continued stirring of the mud by dredging operations has caused the tides to carry great quantities of silt over the bay and into the mouths of the sloughs, where it has settled to the bottom like a blanket, and almost entirely killed the diatoms and other plant life which form the basis of the food supply of fishes.

This condition was called to our attention by Dr. Albert Mann of the Carnegie Institution after he had made a diatom survey of San Francisco and San Pablo Bay waters. Dr. Mann was alarmed by the conditions he found in San Pablo Bay and stated that if we are to preserve our fisheries we will have to guard against the blotting out of diatom life by silt from dredging operations such as are taking place in our bays and rivers. There can be no doubt that the pollution of the waters by sediment from the dredgers has caused the bass to largely abandon their old haunts about San Pablo Bay. Oil pollution may also be a contributing factor.

AS A GAME FISH.

The striped bass is a very popular game fish in the east, principally secured by surf-casting along the coast of southern New England and Long Island. In various rivers, such as the Potomac, small fish are caught by ordinary bait fishing. The baits employed may be squid, strips of some shiny fish such as menhaden, small silvery fishes, pieces

of crab, preferably "shedders," fiddler crabs, "bloodworms," clams, mussels, etc. Sometimes artificial lures, such as "squid," spoons and even flies are effective. (U. S. Bur. Fisheries Memorandum.)

Along the Pacific coast the striped bass is most often caught in the bays near mouths of rivers, in sloughs and slow moving streams.

To the angler the striped bass is "a gallant fish and a bold biter." It is eagerly sought for by a host of anglers because of the excellent sport offered in its capture as well as the delectable white meat so desirable as food.

Night fishing has been much in vogue, but this fish is such an erratic biter that there is no definite proof that fishing is much better during hours of darkness. Legal restrictions have put commercial night fishing under the ban.

Most anglers claim fishing becomes poorer in streams and sloughs during cold or stormy weather. The fish are supposed to seek the deeper pools at the mouths of streams at such times.

Famous old fishing grounds include San Antonio Slough near Petaluma, Oakland Estuary, San Leandro Bay and Petaluma Creek at Schultze's Slough.

Between 1910 and 1915 Cache Slough and tributaries was a notable fishing ground. During this period Mr. George Neale of Sacramento caught many bass weighing from eight to 35 pounds. Reclamation is responsible for the destruction of this area as a fishing ground.

In the clear water of Prospect Slough on the lower Sacramento bass formerly took the spoon readily, and this was a popular fishing ground for those who enjoyed the sport of catching the striped bass with rod and reel. The usual method was to troll behind a gasoline launch. Large numbers were taken in this manner in other sloughs.

Favorite resorts of anglers in the bay region at present are Sausalito, Petaluma, Napa, Rodeo and Crockett. Baker's Beach, San Francisco, is a favorite for surf-casters. Excellent sport is to be found at the mouth of Elkhorn Slough on Monterey Bay near Watsonville. Bait casting from shore brings results in the same locality.

Striped bass take the hook savagely, make runs and sometimes leap from the water, shaking themselves to be rid of the hook. Then they often go to the bottom to sulk. However, the runs of this fish are not so formidable and persistent as those of the steelhead trout and salmon, and the fish is more easily brought to gaff.

In California the same tackle is ordinarily used as is used for salmon. Trolling usually gives the best results in brackish water, but many are taken from the banks of sloughs with hand lines or casting rods. A heavy sinker keeps the hook near the bottom. Bait hooks, plugs and spinners are used. Squid is one of the favorite baits.

In the east the No. 4 or 5 O'Shaughnessy hook appears to be preferred and the white worm or bloodworm is the favorite bait.

Striped bass reach the Napa River and the sloughs in this section from San Pablo Bay by two passages—Mare Island Straits into Shoal Water Bay and Sonoma Creek into the sloughs northwest of Shoal Water Bay. During eight months of the year, September 1st to May 1st, a great many anglers from all sections of the coast states find sport in this region. Many local residents have barks in the sloughs and motor down Saturday afternoons for the week-end fishing. The lower portion of the Napa River is a favorite place, and at Cutting Wharf

several men have boats to hire for this purpose. Cutting Wharf has been taken over by Napa County and put in first-class condition. Ample parking space for autos with gravelled road approaches and comfort stations are provided. On Sundays from 50 to 75 automobiles are frequently parked at this one spot.

"After the heavy rains when the river is washed out, good bass fishing is to be had as far up as the city of Napa. The fishing in 1924 was better in all this section than in any of the past seven or eight years.

"In bait fishing, sardines, clams and bullheads are considered the best. In the sloughs the bass are accustomed to the drawings from wild ducks, hence this makes good bait, as do also breasts of mud hens and skinned small birds such as linnets, sparrows, etc. Bait hooks are usually 5, 6 and 7 sizes. Many artificial lures are used with success—Stewart and Wilson spoons, Nos. 4, 5 and 6; Basserinos, Redhead and Lucky 13; Heddon Wiggler, dark or light according to whether the water is clear or turbid at high tide. Trolling is best over the mud flat feeding grounds. From half-tide to low, the channels give best results."—Dr. Robert Crees.

Ed. J. Glos of Napa reports conditions as follows:

"During the late fall and early winter of 1924 the writer had very good success trolling for bass in the main fork of the Napa River above Cutting Wharf. The fish taken were of exceptionally good size, running from 6 to 37 pounds, the majority weighing from 12 to 20 pounds. Most of the females were full of spawn. The lure used was Heddon plug of the silver side variety, scale finish.

"When fishing in deep water, best results were obtained by trolling behind a power boat and using at least 100 yards of No. 9 line with no sinker. It is evident that the fish stay in schools, for once the fisherman gets a strike he will, by continuing to work the spot, get a strike nearly every time his plug passes the same place.

"Many of the fish strike very lightly two or three times before striking hard and many times they get hooked on the outside of the head. They seem to strike more readily on fast tides than on slow tides, and mostly on outgoing tides, although many are caught on incoming tides.

"Anglers using live split-tail and whitefish have good success. Dead bait, such as sardines, clams, etc., are also good. The writer has cleaned bass with almost every variety of food in their stomachs—one time even a chicken foot—showing that they eat almost anything."

Erratic fishing conditions in Napa River are thus described by W. P. West:

"When using a basserino in waters below the town of Napa, the fish are nearly always caught somewhere on the head or under the gills, very seldom in the mouth. It is believed that the fish strike to fight and not for food. It has been observed that one year someone will use a spoon and make a big catch. Immediately everyone uses a spoon and good catches are made by all, while apparently fish can not be caught with anything else at the time. In the season of 1923 a spoon was the best troll, while during 1924 spoons proved of no avail but bass plugs brought results."

Thirty years ago, W. P. West caught a good many bass at the town of Napa, ranging from 10 to 16 inches, using cooked shrimp as bait.

"In later years, pollution from garages and tanneries has ruined fishing of all kinds in the vicinity of Napa except when rains have purified the river; then it is possible to catch fish in town for a few weeks out of the year, whereas formerly they could be taken nearly the year around.

"During the fall of 1924 fish died in Napa River within a radius of six miles from the city of Napa. The stench from the thousands of dead fish floating on the water became so bad that it was necessary to chemicalize the carcasses.

"Years ago bass were so numerous in the lower reaches of Napa's sloughs that a man rowing a boat would strike a fish every few minutes with his oars. In recent years bass fishing in these sloughs has been largely abandoned because almost every slough that formerly afforded good fishing has been levied off. This prevents the bass from reaching well protected spawning and feeding grounds, and, if the practice is continued, it will surely prevent future increase of the species."

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A SPINY LOBSTER SEASON AT SAN DIEGO.

By Coburn F. Maddox.

At 6 o'clock on the morning of the fifteenth of October, 1923, I hurried to the San Diego water front and the Fishermen's Wharf armed with a "lobster stick" carefully measured off and marked at 10½ inches minimum and 16 inches maximum lengths. This maximum and minimum size limit is set by our California fish and game laws for the taking of spiny lobsters *(Panulirus interruptus)* in season.

This was my first lobster season with the Commercial Fisheries Department of the Fish and Game Commission, and, having heard the talk prevalent on the water front regarding the so-called "lobster fleet," I expected to see the boats come racing in to port as they had done during the preceding albacore season. So imagine my surprise when it was evident that there were no boats "racing" in. It was, in fact, 11.30 a.m. before the first boat of the season, the *Iola*, arrived with a cargo consisting of but two lath wood containers holding but 160 pounds of the delectable crustaceans. These lobsters were alive and of a dark brown color. As they were weighed out by the market man receiving them, they were closely inspected by me. They were then sorted into groups as to size; those measuring from 10½ inches to 14 inches being classed as "smalls" and those measuring from 14 to 16 inches, inclusive, were termed "bulls." The "smalls" bring a few cents more per pound than the "bulls."

The lobsters were then put into metal baskets made of strap iron about an inch and a half wide and spaced about three inches apart. These containers hold 500 pounds and, when filled, were lowered into vats of boiling water containing salt in the proportion of 200 pounds salt to 420 gallons of water—or about a 50 per cent solution of salt and water. After boiling 20 minutes they were lifted out of the vats, a scarlet mass, and dumped out onto a smooth floor, evened out and hosed down with cold fresh water to wash the scum off and partially cool them. When completely dried on the outside and entirely cooled off they were packed in wooden boxes of 100 pounds each ready for shipment to any point in this country by truck or railway express, as they have to be moved quickly when not in cold storage.

The Fish and Game Commission, under a special provision of the law, allows our fishermen to bring in Mexican lobsters after the close of our California season and until the end of the Mexican season, which is usually a month after our season closes, on condition that the captain of a boat whose cargo consists of imported lobsters files an affidavit with the local office of the Fish and Game Commission stating the number of crates (each crate averages 100 pounds) brought into port and that they are lobsters caught in Mexican waters. All imported lobsters may be put into cold storage to be sold during the closed season, provided they are first punched through the tail with the mark of the company or respective market putting them in cold storage. For example, the Star Market marks their lobsters with a star shaped punch, another market has a "V" shaped mark, etc.; any mark being used that will make a legible, clean cut in the tail of the lobster and one not being used by any other market or company. In this way

if any lobsters need to be identified it may be easily done by looking at the list of marks filed with the Fish and Game Commission.

Naturally a portion of the imported spiny lobsters die in transit, and these dead lobsters are sprayed with coal oil and turned over to an independent fertilizer plant to prevent them being sold as "seconds" to the unsuspecting public.

After being punched and packed in wooden boxes, 100 pounds to the box, it is necessary, when shipping out during our closed season, that each box be protected by a permit pasted on it; said permit having on it a number, the name of the market making the shipment, the mark with which the lobsters contained therein are marked, the date of shipment and the signature of the local fish and game deputy on duty at the port of entry. This permit shows any transportation company that the lobsters have been duly inspected, as they are not supposed to accept for shipment any fish or game out of season, and this permit is insurance to the shipper that his shipment will not be opened for inspection en route to its destination.

When it is taken into consideration that it has been shown by scientific investigation that an average spiny lobster is probably between seven and a half and ten years of age before he attains the legal minimum length of ten and one-half inches, one realizes that unlimited catching of this kind of crawfish would soon result in their extermination. The fact that California has never allowed the canning of our local spiny lobsters has greatly helped to save the species from extermination. Fortunately for conservation, the only attempt ever made to can imported Mexican lobsters, an attempt made in San Diego, was unsuccessful due to the process used and the difficulty and cost of importation.

I have described the method universally used in California for handling, cooking, transporting and importing these delicious shellfish which are in great demand by people generally within the state and by the winter tourist element especially. These crustaceans are not only pleasing to the palate but they please the eye as well, for they are usually served broiled on the half shell, and the contrast of the pure white meat with the scarlet red of the shell, the result of cooking, is most attractive.

The season, the start of which I depicted in the beginning of my story, resulted in the receipt of 67,948 pounds by the end of the month of October and 127,635 pounds by the end of our California season, the last day of February, and 746,959 pounds by the end of the Mexican season, April 15th. These figures are put in to give the reader an idea of the volume of business carried on in these shellfish during an average season.

This method of handling local and imported lobsters helps to prevent the depletion of our local lobsters, which a few years ago had become more or less marked. At the same time it prevents any violation of our laws by importers of foreign lobsters.

THE CALIFORNIA RING-TAILED CAT.

By WALTER FRY, in charge Nature Guide Service, Sequoia National Park.

The California ring-tailed cat *(Bassariscus astutus raptor)* is one of the most remarkable animals of the Sequoia National Park. Owing to nocturnal habits it is seldom seen by park visitors, but when once seen it is remembered because of its grace, varied coloring and almost human facial expression of kindliness. This cat belongs to the raccoon family; the body length is about 15 inches, and a round slim tail of nearly the same length is heavily furred to the tip. The body is slender; legs short; height about nine inches; weight about two and one-half pounds; ears broad, one and one-half inches, scantily haired; eyes large, mild and expressive. The fur is strikingly marked with black, white, brown and gray.

The ring-tailed cat ranges from Costa Rica on the south northward through Mexico and Texas, thence on to Colorado, southern Utah, Nevada, and Oregon on the north. Throughout its range it seeks the warmer climates, as it is not well adapted for cold weather. In places it is fairly abundant, while elsewhere it is very rare and in many places wanting. In California this mammal is not plentiful anywhere, but inhabits the Upper Sonoran Zone, usually below 5500 feet, along the western slopes of the Sierras. In other localities the zonal range differs greatly from that in California; in Oregon it is at sea level, while in Mexico it is from sea level up to 10,000 feet.

The California ring-tailed cat is strictly nocturnal in habit and wanders far and near in quest of food, eating almost anything that comes its way. The principal food here is rats, mice, gophers, birds, frogs, lizards, berries, fruit and many insects. Although the animals can run somewhat rapidly and climb trees quickly, they seldom catch their pray except by stalking. These animals hunt alone. I have never heard them give voice except when pursued closely or captured. When approached they will give a short quick bark similar to the California gray fox, and when captured they utter a shrill cry of fear and rage.

The breeding season for this locality is April to June. The young are three and four in number and probably only a single litter is produced each year. The animals den in rock crevices, under logs and in hollow trees. In these dens, on beds of dry grasses and leaves, the young are born with eyes closed. Their bodies are covered with downy fur, lighter in color than that of the adults, and the tail bands are scarcely visible. When six weeks old the young come out of the den and at two months they go on nightly hunts with their mother. The mother weans them at the end of the third month and leaves them to shift for themselves.

I have had many interesting personal experiences with these animals and find them intelligent, bold and inquisitive. They are not combative and they respond quickly to kind treatment, making fine pets.

On May 25, 1906, while I was camped at Rocky Gulch, Sequoia National Park, I saw two beautiful specimens of these cats, an adult male and a female. Both were so good-natured and gentle that it was only necessary to feed them a few times to induce them to come into the cabin with me. They became so tame that they would eat from

my hands, climb into my lap, and sleep in a bed that I prepared for them in the cabin. A few days after my arrival the female had three kittens, about the size of newly born house cats. For two or three days the mother would not permit the father to come near them, but later the family occupied the one bed. The kittens grew rapidly, and when three weeks old the parents began to carry food to them; at the age of about eight weeks they accompanied their parents on nightly hunts, returning to the cabin in daytime. Later I was relieved by a detachment of soldiers, who also made pets of the ring-tail family so that they became as tame as any house cats.

Scarcely any other wild animal has as many names as the ring-tailed cat. In the United States it is known as "ring-tailed cat," "miners' cat," "coon cat," and "band-tailed cat." In Mexico it bears the name of "cacomixtle," except in Lower California, where it is the "babisuri." Despite this nomenclature the animal is not related to the feline family, but is akin to the raccoons. All the common names in the United States are gradually giving way to that of "ring-tailed cat." While this common name is not well chosen, as the term "cat" properly belongs to the feline family, it is now too firmly established to be dislodged.

Will the ring-tailed cat continue to thrive and hold its own under existing laws? Positively, it will not. The animals have no protection except in the national parks; but as the park areas comprise but a small portion of their range the protection from this source is but meager. Outside the parks these pretty animals are being depleted from year to year by the ever-increasing number of fur trappers. The animals in the neighborhood of the Sequoia National Park are not half as numerous as they were ten years ago. They are not endangered on account of their fur, as it is not high on the market; but as the trappers make their sets for other animals of higher fur value, the ring-tailed cats are constantly getting into their traps and are killed and taken along. While the animals are not in danger of immediate extinction in California, I do consider that it will soon become necessary for the state to furnish adequate protection or we shall lose this beautiful California mammal.

It is not safe to upset the balance of nature and destroy the many species of mammals, birds and harmless snakes which prey on rats, mice, gophers, ground squirrels and other vermin. The ring-tailed cats, the badgers, the skunks, the raccoons, and even the coyotes are men's best friends; while as to the hawks and snakes, they destroy hundreds of vermin for each domestic bird taken. Let nature alone and there will be little need to spend millions to poison and to trap vermin. As it is now, the poison and traps put out only too often destroy as many friends as enemies.

The campaign against vermin is too often foolishly and thoughtlessly conducted; and when there is a financial reward for men to trap and poison, the facts of natural science are neglected. Man is but slowly emerging from the savage state when the lust to kill was among the strongest of his instincts. It is easy to appeal to this instinct by labeling animals as "vermin" to be destroyed without proper consideration of the many biological factors involved.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

The articles published in CALIFORNIA FISH AND GAME are not copyrighted and may be reproduced in other periodicals, provided due credit is given the California Fish and Game Commission. Editors of newspapers and periodicals are invited to make use of pertinent material.

All material for publication should be sent to **H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.**

July 19, 1926.

Enterprising enough to be progressive. Conservative enough to be safe.

A STRIPED BASS NUMBER.

No introduced fish in the waters of this state has attracted so large a following of devotees as the striped bass. Angling for thousands, to say nothing of the tons of fish which reach the markets of the state, was made possible by the introduction of about one hundred and thirty-five striped bass secured in the Navesink River of New Jersey, and planted in Martinez Straits near Martinez, together with a later plant of three hundred fish made at Army Point near Suisun. Devotees of the sport throng the trains each week, and Bakers Beach in San Francisco is regularly lined with surf casters. Similar sport is afforded on the larger streams both north and south of San Francisco.

An attempt has been made to furnish those interested with some reliable information on this notable food and game fish. That some features of the article will call forth considerable debate is certain, for as one old time angler put it: "I have fished for striped bass continuously for twenty years and yet I know practically nothing about this fish." Many an angler has found his pet theory upset, not once, but many times. Admittedly the striped bass is erratic in its habits, and what may happen in one place does not always hold in another.

But one point of view has been attempted—that held by the scientist who may many times have little actual field experience, but who is skilled in the compilation of dependable data. That of the angler himself who often depends entirely upon field observation remains to be presented at some future time.

We warn all readers who find this number of particular interest to place his copy in safe keeping, for, judging by past experience, special numbers of this kind are quickly exhausted, and impossible to replace.

PLAN DETERMINATION OF AGE AND RATE OF GROWTH OF STRIPED BASS.

Complaints of decrease in the abundance of striped bass have led the Commercial Fisheries Department to undertake a basic investigation regarding the life history and habits of this fish. Under the direction of Professor J. O. Snyder of Stanford University, an effort is being made to determine the age and rate of growth of the striped bass by a study of the scales. Measurements and scale studies are already helping to answer the questions as to whether the striped bass migrates to sea every year with a return movement for spawning and as to the age when this fish becomes mature.

TROUT TACKLE FOR STRIPED BASS.

In connection with striped bass fishing, we think of heavy tackle. Casting rods are used extenisvely. However, whenever there is a run of small sized bass in the Napa River, many obtain thrilling sport by using trout rods. The best class of sportsmen are always seking refinements in modes of angling, and this is, perhaps, a step forward. Certainly it takes greater skill to successfully land a striped bass with trout tackle.

CONVENTION OF FISH AND GAME EMPLOYEES.

On March 5 and 6, 1926, the employees of the Fish and Game Commission for the first time got together for a conference. Friday was given over to civil service examinations and to a visit to the University of California. On Saturday all day sessions were held ending with a banquet in the evening. The program was educational in nature and the outsanding features were the attendance at the afternoon meeting and the banquet of Governor Friend Wm. Richardson, the presence of Dr. H. J. Donaldson, president of the Pennsylvania Game Commission, and the opportunity afforded for employees to really know and appreciate the splendid commissioners who direct the work of conservation, and their competent executive officer. Everyone concerned was impressed with the splendid body of men who enforce the fish and game laws of the state, and a fine spirit prevailed throughout the meetings. Never was there a more united approval of a project nor a more imperative demand for a meeting

of the same kind to be held annually. The commonest comment made was, "this should have been done long ago."

On March 7th, automobiles took the men to the new Yountville Game Farm in Napa County where a picnic lunch was eaten on the grounds. Superintendent Bade of the game farm conducted the men about and furnished much valuable information.

BRIEF REPORTS ON CURRENT ACTIVITIES WILL APPEAR UNDER NEW DEPARTMENT HEADING.

It has always been the policy of this magazine to attempt to bring to its readers the current activities of the Fish and Game Commission. A series of monthly reports from various department and bureau heads now make it possible to add a new department to the magazine under the heading "Commission Activities." (See p. 101.) In this department will be found statements pertaining to the plans of and accomplishments of the commission.

SCREEN AND LADDER CONFERENCE.

On March 31 there was held at the executive offices one of the most important conferences ever attempted by the commission. By invitation there assembled representatives of practically every power company in California, interested officials of irrigation districts and irrigation companies, and private individuals charged with the maintenance of screens and ladders in California rivers and streams. The purpose of the meeting was contained in the following letter addressed to these persons by the executive officer:

The Fish and Game Commission is desirous of calling a conference of power companies, irrigation districts, private water companies, and individuals interested in the maintenance of screens and ladders in California streams.

In the past considerable friction has existed between the Commission and the various persons and companies affected, and it seems that the time is now opportune to settle old difficulties and plan to cooperate for the future.

With this end in view, the officials of the Commission charged with the duty of enforcing screen and ladder laws feel that a general and free expression of opinion on both sides of the question will bring immediate results and clear up the situation. We desire to inaugurate a policy for the future and ask your aid and suggestions. It seems to us that there is no necessity for any antagonistic attitude on either side and with these objects in view, we earnestly ask you to be present at a conference to be held in the office of the Fish and Game Commission in the Postal Telegraph Building, San Francisco, on Wednesday, March 31, 1926, at 10 o'clock a.m.

Will you kindly indicate to the undersigned whether some person will be at this conference to represent you?

A splendid attitude of cooperation was shown by the engineers who assembled. The point which brought out most discussion was as to the feasibility of screens in certain types of streams. It was definitely pointed out by the representatives of the Fish and Game Commission that judgment as to whether a screen is needed or not would not be ceded to any committee but that this judgment is entirely in the hands of the Fish and Game Commission. The main need so far as the commission is concerned is engineering advice as to the selection of the particular type of screen to be used under given conditions and wholehearted cooperation in the enforcement of the screen and ladder law.

As a result of the meeting two committees were appointed to work with the experts of the commission. The committee for the power companies, the high stream diverters, is made up of G. H. Bragg, chairman, Pacific Gas and Electric Company, W. H. Dennis, Southern California Edison Company, H. K. Fox, San Joaquin Light and Power Company, W. L. Huber, Southern Sierra Power Company. The committee representing the irrigation districts, low stream diverters, G. H. Atherton, Delta Farms Company, Stockton, W. L. Combs, South San Joaquin Irrigation District, and William Durbrow, Glenn-Colusa Irrigation district.

These committees are to report some time in the future as to their findings.

There is no necessity for an antagonistic attitude on either side, and it was impressed on the gathering that the commission is more than willing to cooperate, in every particular, to the end that the laws affecting fish screens and ladders may be enforced without working a hardship upon anyone.

CALIFORNIA MAN APPOINTED ON ADVISORY COMMITTEE ON FISHERIES.

In recognition of his accomplishments in fisheries conservation work in California, N. B. Scofield, in charge of the Department of Commercial Fisheries of the Fish and Game Commission of California, was accorded an exceptional honor by Secretary of Commerce Herbert Hoover when he was selected to serve as one of the five members of a recently appointed advisory committee on scien-

tific investigations for the United States Bureau of Fisheries. In creating this board it was Secretary Hoover's object to bring together a wide range of interests particularly able to advise Commissioner of Fisheries Henry O'Malley in the scientific program of the bureau in order that it may give the most adequate results for the needs of the fisheries throughout the country.

During the past ten years as director of the commercial fisheries work for the State of California, Mr. Scofield has built up a program for the conservation of the fisheries which far surpasses that of any of the other states. Under his direction a state fisheries laboratory has been established, and the quality of the work being carried on by its corps of research workers has been recognized by our federal government to the extent that two members of the staff, Elmer Higgins and O. E. Sette, have been chosen as division chiefs for the United States Bureau of Fisheries, while Will F. Thompson was selected from there to direct the halibut investigations for the International Fisheries Commission.

Mr. Scofield has been active in the promotion and enforcement of fisheries legislation and has gained particular recognition in his efforts during the past seven years to conserve the sardine supply by preventing the unrestricted use of fish fit for human consumption in reduction plants.

A NEW INTERNATIONAL FISHERIES COMMISSION.

Word was received on April 28 that as the result of a new Mexican treaty an International Fisheries Commission of four members has been appointed by President Coolidge. As one of the members of the commission, the president selected Mr. N. B. Scofield, in charge of the Commercial Fisheries Department of the California Fish and Game Commission. The other American member of this commission is Henry O'Malley, chief of the Federal Bureau of Fisheries, and the Mexican appointees are Jose R. Alcarez, chief of forest service, and Carlos E. Bernstein, in charge of fisheries in the Gulf of California district. The duties of the new commission are as follows:

"To aid the labors of corresponding agencies in the nations represented in conservation measures.

"To prevent smuggling of marine products.

"To make recommendations relative to revenues upon imports and exports of fish."

This is the second honor to be conferred upon Mr. Scofield within the past few months. The commission takes pride in the fact that Mr. Scofield's ability has been thus recognized. It is expected that even though his new duties may separate him from direct service with the Commercial Fisheries Department he will continue to act in an advisory capacity.

THE NEW YOSEMITE HATCHERY.

A hatchery in Yosemite National Park has been agitated for some time. Once complete plans had been drawn and construction work practically started, difficulties arose which postponed construction. During April, 1926, at a meeting held in San Francisco, an agreement between the National Park Service and the Fish and Game Commission was drawn up which provides for the lease of land in Yosemite National Park and the construction thereon of a hatchery building, and rearing ponds. The agreement also provides for the erection of an aquarium for the display and exhibition of various species of fish. The contract holds for the term of ten years with provision made for renewal.

As originally contemplated, the hatchery was to be built of stone and was to be located near the confluence of Illilouette Creek and the Merced River.

From an educational point of view a hatchery could not be located in a better place. Over two hundred thousand visited the park last year and when the new road is open the numbers will probably double. Many of the thousands of visitors would gladly make use of an opportunity to see a fish hatchery in operation. Persons having seen the methods used in fish propagation would become more interested in fish conservation.

VIOLATORS TAKE NOTICE!

The new dollar-a-year deputies recently appointed by the Fish and Game Commission will have full powers to enforce the fish and game laws. Furthermore, the names of these men are to be kept secret with a definite purpose in view. Many a violator this coming year will rather suddenly wake up to the fact that the man near him on the stream or the hunter in the next blind is a full fledged game warden when he is suddenly arrested for having more than the limit of fish or of ducks.

Most of the regular deputies are marked men so far as the violator is concerned, but it will take some time for the violator to become acquainted with all of the dollar-a-year men which have been appointed.

We wonder whether there are many other instances where men are sufficiently enthusiastic about a natural resource to be willing to do the "dirty work" of law enforcement with no greater incentive than that of helping to conserve a natural resource.

NEW REARING PONDS CONSTRUCTED.

Heretofore it has been the policy of the Fish and Game Commission to hold and feed trout at the hatcheries until about two to three inches long before planting; now plans are being made to hold some fingerlings until three and one-half to five inches long and then liberate them naturally in various streams.

FIG. 18. Black-tailed deer feeding in a meadow in Monterey County. Photograph by William Jeffrey.

The plan contemplates the construction of fifteen rearing ponds which will accommodate about 2,700,000 small fish. In most instances these ponds will be built along side of some mountain stream that needs constant stocking and the young fish will be cared for by experts.

Local sportsmen's clubs are planning the construction of four of these holding ponds. One such pond, to be built in Castle Creek near Dunsmuir, Shasta County, will accommodate 150,000 fish. Two such rearing ponds will be located in the Tahoe region; one of them to be the largest of all with a capacity of 400,000 fish. A new pond at the Fort Seward Hatchery in Humboldt County will care for 100,000 fish.

Other western states have experimented with the pond rearing system for several years, and this year California will take a foremost place in experimentation of this kind.

OUR GREAT TASK.

With the ever-increasing population of our state, the easy accessibility of our forests and streams caused by the building of highways and trails and the use of the greatest destroyer of life, both human and wild animal—the automobile—we have a hard and never-ending task before us to protect the remaining animals and fishes of our state. Forty years ago there were more fish and game in one county in California than there are now in half the state. When I began to study the problem of conservation as a boy and young man, forty years ago, there was only a population of 800,000 in the entire state, and no one advertised California as the sportsmen's paradise at that time, for the elk and antelope were practically exterminated and a marked depletion was already noticed among the fish in our inland waters as well as among the smaller game animals and birds. Now, with a population nearly five times as great, and everybody looking to the great out-of-doors for pleasure and recreation.

and the capitalization of our wild life by writers and advertisers urging the whole world to come to California, we are facing a stupendous task. We can only hope to keep what is left of our wild life by working earnestly for a shorter hunting and fishing season and using all our efforts to meet the new policy of cooperation and friendly relationship in the great task before us.—W. H. Shebley.

PIECING OUT THE BAG LIMIT.

It seems almost incredible that certain so-called sportsmen continue to piece out their bag limits. It was reported to us recently that a man made this statement: "The early morning flight was almost entirely of small ducks. I secured my limit but just about this time the big ducks began to come in and, desiring some good mallards, I continued to shoot. Each time I secured a mallard or a sprig I took a small duck out of my bag and threw it into the water, thus returning with a legal limit of large ducks."

It is also well known that some men, certainly we can not call them sportsmen, while shooting quail with a pump gun kill a large number of birds and then without spending much time to search for them continue to kill enough birds so that they secure their limit without any extra exertion in searching for lost or wounded birds.

Even falling back on "the spirit of the law" does not excuse *waste*.

HUNTING ACCIDENTS—1925.

As in past years a compilation of hunting accidents for the year 1925 has been attempted. Unfortunately accurate data relative to such accidents are not available from the Bureau of Vital Statistics. It has, therefore, been necessary to make the compilation from newspaper clippings which have reached our office. This method is certain to allow of error and furthermore does not give a complete check on the number of hunting accidents, in fact, it seems doubtful whether more than two thirds of the accidents in the state are actually accounted for by this method.

In spite of the acknowledged inaccuracy the compilation should bring vividly to the mind of every user of a gun that he is handling a weapon which is potentially dangerous to human life. As has been suggested before, the work of compilation is worth while if it will put to shame those responsible for accidental shooting of fellow humans, and awaken others sufficiently to handle their weapons with more care.

The huge toll taken annually in the United States is stirring many states to act, and compilations are made and wide publicity given in almost every state. The Game Commission of Pennsylvania not only tabulates the hunting accidents of that state under fifteen different headings, but is collecting data from all other states. The more populous a state grows, the more certain is a large crop of hunting accidents annually as is evidenced by the fifty-two fatal and 229 non-fatal accidents recorded in Pennsylvania for 1925.

Everyone admits that most of these accidents are preventable and consequently education along the lines of careful handling of a gun should be the most effective means of prevention.

This past year, there were several accidents due to a loaded gun in a motor vehicle. In some states it is made a misdemeanor to carry a gun in an automobile unless it is unloaded and dissembled.

HUNTING ACCIDENTS, 1925.

Killed.

Name	Shot by	Date	Locality	Circumstances
Abrew, Tony A.	Self		Ryde	Shotgun accidentally exploded, charge entering abdomen.
Bruere, Samuel (33)	A. F. Gilbert	Dec. 17, 1925	Yreka, Siskiyou County	Shotgun discharged when it caught in clothing, shattering victim's left leg.
Calvin, A. Raymond (30)	Self	Dec. 9, 1925	Grass Valley, Nevada County	Rifle in truck accidentally discharged, shooting victim through the body.
Cuneo, Angelo P. (14)		Sept. 27, 1925	Clinton, Amador County	Shotgun fell from seat of auto, charge striking victim in face and abdomen.
Hanson, Peter (16)	Self	Dec. 1, 1925	San Rafael	Shotgun discharged when accidentally dropped.
Hemphill, B. (64)	Virgil Ward (28)		Korbel, Humboldt County	Shot in back when companion stumbled and accidentally discharged rifle.
Hinds, Archibald F. (13)	Self		Atwater	Shot in head with rifle while crawling through fence.
Imperatice, James	Self	Oct. 27, 1925	Gustine	Shotgun accidentally discharged while cleaning.
Luttrell, Bernard L. (27)	Self	Oct. 12, 1925	Moffatt Creek, Siskiyou County	Trigger of rifle caught on twig when descending tree, shooting off side of head.
McCauley, Al	Self	Sept. 7, 1925	Mina, Mendocino County	Rifle accidentally discharged while being used to assist in climbing steep bank.
McGee, David Porter (21)	Francis Kendall	Sept. 5, 1925	Redding, Shasta County	Shot in back by companion carrying rifle with trigger cocked.
O'Hare, Roy (18)	Self	Oct. 15, 1925	Corning, Tehama County	Shot in chest by shotgun while crawling through fence.
Pratt, Samuel	Self	Jan. 12, 1925	Red Bluff	Gun accidentally discharged when victim handed shotgun to companion.
Reed, Rolan (19)	Jack Dalton	Jan. 2, 1925	Sacramento	Companion's rifle accidentally discharged while cleaning, shooting victim in stomach.
Salvini, Pete	Self	Oct. 27, 1925	Lincoln, Placer County	Shotgun accidentally discharged shattering right hand and tearing away side of face.
Solaro, Louis (23)	E. M. Goodbar		Pittsburg	Shot in the head by companion firing at flock of ducks.

HUNTING ACCIDENTS, 1925.

Wounded.

Name	Shot by	Date	Locality	Circumstances
Andrus, William (22)	Companion		Coloma, San Mateo County	Flesh wound in leg caused by accidental explosion of rifle being loaded by member of hunting party.
Barpholm, G.	Self		The Geysers, Mendocino County	Rifle discharged while crawling through fence, causing bad wound in left forearm.
Bartels, R.	Self	Sept. 9, 1925	Orland, Glenn County	Victim fell on slippery ground, discharging rifle and causing painful wounds in left foot.
Beall, Ernest	Self	Nov. 16, 1925	Stockton	Shotgun burst, injuring left hand.
Bloch, Emile (14)	Harry Cramer (13)	Nov. 16, 1925	Dry Creek Valley, Sonoma County	Shot in head by companion who mistook him for a rabbit.
Brandenberg, Orayne (17)	Jack Dalton (19)		Sacramento	Revolver discharged accidentally while being cleaned, striking victim in chest, seriously wounding him.
Breakenridge, Harold (19)	Jesse Cave	Nov. 9, 1925	Berkeley	Victim shot through the neck when Cave snapped the trigger of a rifle which he supposed was not loaded. Injury not serious.
Callander, W. C.	Self	Oct. 9, 1925	Chico, Butte County	Shot in heel when rifle was accidentally discharged.
Carpenter, Cecil (18)	Self	Dec. 12, 1925	Gridley, Butte County	Shotgun accidentally discharged, tearing hole in left breast.
Casagrande, Louis	Charles Reynolds (15)	Aug. 5, 1925	Cloverdale, Mendocino County	Companion stumbled over a limb, discharging rifle, bullet passing through back and abdomen.
Cavezas, Rigo	Self		Berkeley	Shot in leg while cleaning shotgun.
Crowley, Charles	Herbert Williams	Sept. 9, 1925	Yuba River Bottoms, Sutter County	Trigger of companion's gun caught on twig, charge wounding victim in left shoulder.
Daily, Clifford	Companion	Sept. 7, 1925	Trinity Mountain, Trinity County	Companion shot at deer, causing several bullets to enter Daily's shirt sleeves. Not injured.
Fiske, Herbert	Unknown hunter	Sept. 10, 1925	Medicine Lake, Siskiyou County	Shirt and coat shot full of bullet holes.
Germond, Ramona (26)	Self	Sept. 29, 1925	Fresno	Shotgun accidentally exploded while hunting, causing wounds in both legs.
Greco, John	Self	Nov. 9, 1925	Lathrop, San Joaquin County	Shot off left hand while holding it over the muzzle of his shotgun.
Hanson, Jimmy (16)	Self	Nov. 30, 1925	San Rafael	Shotgun accidentally discharged while hunting.
Mack, Ernest	Unknown hunter	Sept. 10, 2925	Auburn, Placer County	Bullet fired by unknown hunter ripped through windshield of machine, striking victim in chest.
Mason, Jay R.	Earl Badger	Nov. 30, 1925	Redding, Shasta County	Companion in falling discharged rifle, shattering both bones of victim's left leg.
Mills, Walter (14)	Self	Oct. 11, 1925	Pacific City, San Mateo County	Shotgun dropped accidentally, charge shattering boy's chest.
Murphy, Warren (17)	Self	Sept. 16, 1925	Wawona, Mariposa County	Rifle became clogged, victim hammered it with a rock, causing it to explode, destroying left eye.
Nevis, Lloyd (7)	George Nevis		Sacramento	Brother cleaning shotgun accidentally discharged it, causing serious injuries.
Ramsey, Levi (16)	Companion	Sept. 5, 1925	Napa, Napa County	Victim hit in body when shotgun accidentally discharged.
Russell, George S.	Party of hunters	Oct. 22, 1925	Cloverdale, Mendocino County	Party of quail poaching hunters seeing feather in victim's hat opened fire, causing shot to enter head.

HUNTING ACCIDENTS, 1925—Continued.

Wounded.

Name	Shot by	Date	Locality	Circumstances
Shaw, Walter S.	Self		Sacramento	While pointing at birds, shotgun held on running board accidentally discharged, shooting off three fingers of right hand.
Shrader, William	Ray Brown	Sept. 5, 1925	Paskenta, Tehama County	Victim mistaken for deer; right arm shattered.
Sperry, George and Willis (14)		Sept. 5, 1925	Napa, Napa County	Shotgun accidentally discharged at camp, striking George in side of head and wounding Willis severely in the arm.
Tantau, William	Self	Dec. 21, 1925	Redding, Shasta County	Shot in foot while quail hunting.
Thompson, A. J.	——— Buckman	April 24, 1925	Groveland, Tuolumne County	Victim mistaken for deer; right thigh shattered by shot.
Wilkie, M. J.		Nov. 7, 1925	Oakland, Alameda County	Shot by unknown hunters, receiving several birdshot wounds.
Wright, Edward A. (21)	Self	Sept., 1925	Berkeley	Shotgun slipped and discharged; shots perforating abdomen caused serious injury.

HUNTING ACCIDENT DATA 1924 AND 1925.

	1924	1925
Number persons hunting	250,000	*250,000
Number persons killed	15	16
Number persons wounded but not killed	22	32
Number self-inflicted accidents:		
Fatal	8	11
Nonfatal	13	15
Number accidents inflicted by others:		
Fatal	7	5
Nonfatal	9	17
Occurred while hunting large game (elk, deer, bear, etc.):		
Fatal	2	7
Nonfatal	6	13
Occurred while hunting small game:		
Fatal	12	9
Nonfatal	16	16
Occurred while hunting unknown game	0	3
Weapons causing accidents:		
Rifles	9	20
Shotguns	27	27
Revolvers (including pistols)	1	1
Unclassified	1	0
Where occurred:		
In fields or on waters	25	25
In forests	6	15
In conveyances	3	3
Unknown	2	5
Number injured or killed in mistake for game or other wild creatures, if known:		
Killed	1	0
Wounded	2	5

*Approximately.

Boys under 18 years of age responsible for an undue percentage of the injuries or deaths, about 20 per cent.

DISTRICT ATTORNEY WARNS HUNTERS.

Prior to the opening of the hunting season last fall the district attorney of Trinity County issued a statement that he would hold hunters to strict accountability if they killed or wounded other hunters. In this stand he was supported by the Forest Service.

Supervisor B. H. Mace addressed the following communication to all district forest rangers under his jurisdiction:

"In order to reduce to a minimum the liability of accidental shooting of human beings for deer or other game animals, the district attorney of Trinity County has decided to call every person responsible for accidental killing or injuring to strict account.

"In all cases arrests will be made and the party required to explain the circumstances of the accident in court. Therefore, in order to cooperate fully with the authorities in this commendable stand, I should be glad to have you instruct all fire guards to take prompt action if a case of accidental shooting in Trinity County comes to their attention in order that the responsible party may be detained until the arrival of the county officers."

THE ISSUE OF THE RANGE.

Conservationists everywhere have been incensed at the attempt of western stockmen to obtain additional concessions in the national forests. At a recent meeting of the Fish and Game Commission resolutions opposing the bill now before congress were sent to California senators and congressmen.

The stockmen are seeking the following concessions:

1. Reduction of the grazing fees on the national forests to rates equivalent to the government's cost of administration. This would mean $3,000,000 from the annual revenue of the national forests.

2. A legal status to grazing on the national forests.

3. Authorization of the creation of a commission with authority in grazing affairs superior to that of the Secretary of Agriculture.

4. The turning of unreserved public lands, aggregating 188,000,000 acres, over to the states or have them regulated by the federal government.

If these concessions are granted, the stockmen will acquire a property right to grazing lands, which will figure as a very serious menace for conservationists to combat.

WILD TURKEYS TRIED IN SAN DIEGO COUNTY.

Last year the San Diego Fish and Game Protective Association secured some wild turkey eggs from Louisiana. These eggs were sent to the San Diego Zoo, but as it had no setting hens with which to raise them, they were turned over to Mr. Glazier, who has a ranch at El Cajon, California. Seven of the nine eggs hatched. The young grew to be large as the ordinary tame turkey, and became quite domesticated. One of the turkeys was killed by a lynx, another injured so badly that it died soon afterwards. The remaining five were then sent to a new game farm near Otay dam south of San Diego where an attempt will be made to raise more this year.

WATER POLLUTION.

So many instances of the pollution of the rivers and harbors of the state have

come to the attention of the Fish and Game Commission that the commission has organized a special bureau to investigate and secure evidence of pollution. An experienced man, Mr. Rolin G. Watkins, heads this bureau and he will conduct a survey of the entire state. Owners of broken oil or gas pipe lines, distilleries, factories or other public utility corporations discharging refuse or poisonous matter into the waters of the state will be held to answer in the courts. No favors will be shown.

That the courts stand ready to help in preventing water pollution is evidenced by the fines which have been imposed in two recent cases where oil and other refuse was being pumped into San Francisco Bay.

FIG. 19. Wild turkeys reared for the San Diego Fish and Game Protective Association by Mrs. Guy O. Glazier. It is the intention of the Association to stock the Cleveland National Forest Game Refuge in San Diego County.

THE BEST GAME WARDEN.

It is impossible for the game warden to catch every offender, so why not help him? People are governed to a great extent by what the other person may think of them. When your neighbor comes in with more than the bag limit, do not admire him for being a good shot, and for being clever enough to put it over on the game warden, for then you encourage him. Tell him the truth instead. Point out he is breaking the law, explain why such a law was passed, and if he is a true sportsman he will appreciate your frankness. If not, you may lose what you thought was a friend but you will be helping your game warden and may be making one less offender for him to watch.

A NEW POLLUTION PROBLEM.

The opening of the season on cormorants and the white pelican has not only started up considerable opposition among bird students, but is becoming the basis of a new pollution problem. Many hunters accept such an opportunity to utilize large conspicuous birds as a mark, shooting "for the fun of it." Instead of retrieving the birds, they leave them to decay and rot in the lakes and streams. The surfaces and shores of certain lakes are lined with the bodies of such dead birds with the result that the drinking water is contaminated.

Considerable complaint has come from San Diego County where there are several large storage reservoirs and where these unprotected birds have fallen to the duck hunter's gun. At Cuyamaca Lake, forty-eight dead birds or hopelessly crippled birds were counted within 300 yards of the shore line.

Certainly it should not take more than a statement of this kind, brought to the attention of duck hunters, to stop this wanton slaughter with its consequent pollution of drinking water.

A RARE TROUT FROM LOWER CALIFORNIA.

The rare Nelson's trout was recently found by members of a scientific expedition from the University of California in the Santo Domingo River, Lower California.

Mr. Chester C. Lamb, Assistant Curator of Mammals, Museum of Vertebrate Zoology, who participated in securing the collection, has this to say regarding *Salmo nelsoni*:

"So far as known, only one stream in Lower California is inhabited by trout, namely, the Santo Domingo River. This stream heads on the west slope of the San Pedro Martir Mountains, and the trout exist chiefly in one of its branches, San Antonio Creek, and in that branch almost altogether above Rancho San Antonio. At the time our fish were collected, it is believed that the species existed in only about five miles of the course of the stream, for the reason that at least 15 miles of the lower course was, at that season, dry. About five miles above Rancho San Antonio are waterfalls above which no trout are known to occur.

"There are persistent rumors to the effect that sooner or later the waters of this stream are to be diverted for power purposes from a point above those falls, in which case, unless the trout be transplanted to other waters, the species would become extinct. It is believed that there is no other stream in the region that affords permanent flowing water, such as the trout could survive in."

The cañon of the river in which these trout live is narrow and deep, and the water, according to Mr. Lamb, at times becomes warm. Insect life, too, is plentiful. The trout were found to be exceedingly abundant and easily caught. About 150 were taken on two fly hooks, one a brown hackle and the other a royal coachman.

The presence of this trout in this southern stream is explained in that favorable climatic conditions probably once existed which allowed trout to extend their range. In fact the rainbow's ability to migrate through salt water makes establishment in any large stream possible. After a very close comparison with the other species of trout it has been found to bear a great resemblance to the rainbow trout in that the size and number of scales is almost the same. The coloring also is very similar. This trout is best accounted for as a geographic race, its slight variations from the rainbow trout being explained by its isolation from all other fish and adaptation to new conditions. A discussion based on sixty specimens of this race, *Salmo nelsoni*, by J. O. Snyder of Stanford University, may be found in Univ. Calif. Publ. in Zool., vol. 21, no. 17, pp. 419-426.

MEAGER INFORMATION ON GAME VIOLATIONS LEADS TO CONVICTION.

On the fourteenth day of January, 1926, I received a report as follows: That Ray Taylor of Susanville was going from one to another here in town, and asking them if they wanted to buy a quarter of venison for $7.50 a quarter, telling them that it was good meat and that Bert Bristol had bought a quarter. The report also went on to say that the deer were being killed in the Milford section of Lassen County. I received this report some three or four days after the meat had been sold and thought that it was too late to find any of the meat around town. It was not known who killed the deer or the exact place where the violations were going on. I laid a trap to catch the parties who were coming in to sell and deliver this deer meat, but I did not get any results. It seemed as though they were not going to bring in any more meat to sell at present.

On January 22, 1926, I drove to Milford and saw Forest Ranger Bruce Torgny and told him what I was looking for. I asked him if there were any trappers in that section trapping and hunting. He did not know of any. However, he told me that he was into Meadow View Station on the twelfth of January and that he met a party of three coming out in a Star touring car. He said there seemed no reason for anyone to be in there unless they were hunting at this time of the year. We decided to go there and see if we could find out what they were doing in there, as we could easily find their tracks in the deep snow. We made the trip in there the next day, but found nothing that would give us anything to work on and returned to Doyle. Here I saw one of my sources of information, which I try to have throughout my district in all the communities. He told me that there were two men at the old Porter homestead; that they were trapping, hunting and making jackass brandy. He said that one of them was a lumberjack from Westwood and that the other one was Jack Porter; that neither of them were any good and were of a bad character. He said that Porter had come back there to winter several times and that he al-

ways killed deer out of season and that he believed that these two men were the men that were selling the meat in Susanville, as trapping had been poor and they were short of money and grub. Ranger Torgny and I proceeded to Susanville for a search warraut. I thought it best to have plenty of assistance, so laid my information before the sheriff. He at once decided to send two of his deputies with me to assist in making the search, which we did.

On searching the Porter homestead we found at the end of a well used trail about 50 feet from the house a box, just about the right size to carry in a car, packed over half full of deer meat all cut up, which was parts of two deer. We had to leave one of the men there, as there were the two deputy sheriffs, Ranger Torgny, myself, prisoner, and the box of deer meat, which weighed quite a lot. We also had bad roads to go over. Porter had his car torn down with the rear end out and some of the gears broken. I thought that it would give him a chance to get the things together so they would not become lost, as it did not look like he would leave the country without his car. He promised to come in on Monday, but instead beat it to Nevada the next day, and I have heard nothing of him since. Fred Abbatt plead guilty on Monday, and just after he plead guilty and before the judge sentenced him I asked him if he knew Ray Taylor of Susanville, if he was in Susanville on or about the 12th of January, and he said he knew Taylor and that he was in Susanville on the 12th.

I then gave my evidence to the court showing that Fred Abbatt and J. W. Porter must have had something to do with the selling of deer meat in Susanville. Nevertheless, the judge only levied a fine of $50 or 50 days in Lassen County jail, and Abbatt is serving his time, as we knew he would have to. Of course this is some time to stay in jail for having deer meat in your possession.—C. O. Fisher, Susanville, California.

ALASKA HAS GAME COMMISSION.

Alaska now has a game commission to carry on conservation so that the fur and game resources will not only be maintained but increased. This is a result of the last session of the sixty-eighth congress when a bill was submitted that had been planned by sportsmen and conservationists of Alaska and the United States. The commission consists of five members, one a representative of the Biological Survey, who is the executive officer and fiscal agent, the other four from the four judicial divisions of the territory. These men have shown a keen interest in their responsibilities, and there is a very bright outlook for the future of Alaskan wild life.

REAL RESULTS IN BIRD BANDING.

As evidence of the worthwhile interest in bird banding, a résumé of operations for 1925 by one such bander in Berkeley is of interest. During the season 573 birds were successfully banded, representing 22 different species. There were 644 repeats and 38 birds returned that had been banded in previous years. With such concentrated work in a particular area our knowledge relative to the migrations and habits of birds should be greatly increased during the next few years.

EFFECT OF OIL POLLUTION ON MARINE AND WILD LIFE.

The Department of Commerce, Bureau of Fisheries, Washington, D. C., last year published a bulletin on the "Effect of Oil Pollution on Marine and Wild Life." (Bur. of Fisheries Document, 995, pp. 171-181.) The conclusion reads as follows:

Marine life and aquatic birds along the Atlantic and Gulf coasts have suffered seriously from pollution of waters by petroleum oil, but other industrial wastes are undoubtedly responsible for much of the damage done. This is a serious problem, primarily because of the vital importance of aquatic life as a source of food. Oil pollution is detrimental to shellfish by destroying the larval forms and rendering the adult mollusks and finny fish unfit for food. It causes considerable destruction of fowl, rendering the birds helpless through its mechanical action on the feathers.

SONOMA COUNTY SCHOOLS HOLD BIRD STUDY CONTEST.

Last fall the county superintendent of schools of Sonoma County planned a bird study contest with the purpose of awakening interest and kindly feeling toward birds. The teachers of the elementary schools were brought together every two weeks for study, and mimeographed helps were furnished every teacher. A list of some fifty common birds were chosen as subjects of study. The contest closed on January 16 when a lecturer from the Fish and Game Commission gave a lecture. Contestants wrote down the name of each bird as it was shown on the screen. A prerequisite for taking the test was demanded in the form of a bird calendar giving the name of the bird, the date, where seen and habits. All the children who were able to correctly identify, from the pictures thrown on the

screen, 25 different kinds of birds, were given a ribbon as a reward.

This scheme was so successful in stirring up interest in birds and conservation that this move of Sonoma County will doubtless be followed by many other counties in the state. The best basis for a future conservation program is to be found in well laid educational plans in the schools of the state at the present time.

PROTECTIVE ASSOCIATION FORMULATES PRINCIPLES.

The following excellent principles were recently adopted by the San Joaquin Fish and Game Protective Association:

This association is formed for the protection and conservation of fish, game, song birds and forests, to create a better understanding of the rights of the farmer and more appreciation of the privileges granted the sportsman by the farmer; to encourage the propagation of fish and game and the restocking of the game fields and public waters; to cooperate with the state, county and municipal authorities in strictly enforcing the laws for the protection of fish, game, song birds and forests, and to assist generally in creating a better understanding and appreciation of the value of wild life to the people and the necessity of its proper protection in order to insure a future supply.

With this object in view we hereby pledge ourselves not only to obey the laws of the state pertaining to the protection of fish, game, song birds and forests, but to use our influence to have others obey them.

We agree to report to the executive committee of this association the name of any individual who may to our knowledge violate these laws, or any of them, and if need be to testify against such person to secure his conviction.

LUMBERING TOWN HAS MANY HUNTERS.

The lumbering town of Westwood in western Lassen County contains a large group of sportsmen. It is estimated that at least 1200 men hunted deer last season, and during the past year the stores of that city sold 90,000 shotgun shells. Splendid work is being accomplished by the Westwood Rod and Gun Club.

FIG. 20. Visitors to Sequoia National Park get worthwhile entertainment by watching the bears come in to feed at the bear pits. That they may even be seen in broad daylight is evidenced by the photograph. Photograph by R. A. Abbott.

LOWER KLAMATH LAKE STILL A PROBLEM.

That the restoration of the Lower Klamath Lake reservation is a complicated matter is evidenced by the fact that there are really four parties interested, all with certain rights. The owners of the land hold a contract with the Bureau of Reclamation which gives them certain rights including water rights. In fact,

they are to use the water which formerly went into the Lower Klamath Lake on their lands, and what's left over is likely to be pumped or drained into the lake bed and thus part of the lake used as a sump. When the water rights are considered any problem becomes involved. Furthermore, land owners have planted certain areas of the reclaimed land with crops and are making an earnest endeavor to make their projects profitable. To this date they are encouraged rather than discouraged and have paid all of their assessments regularly to the government.

The California-Oregon Power Company owns certain water rights on the Klamath River and will naturally refuse to turn a large quantity of water back into the lake unless allowed to draw it off again during low water on the river. This means that were the rest of the lake bed utilized as a storage reservoir, there would be constant change in water level, and this would endanger breeding water fowl.

Unfortunately, sportsmen and conservationists apparently count least in the matter for the rights and are rather intangible as against those of the land owners and the water right owners, even though it may seem that a better use could be made of the area.

With matters so involved it appears that we should first learn the great lesson that the time to act in such matters is when drainage is first proposed and not after a project is completed. If there is anything to be gained beyond this important lesson, it will have to be gained through long years of struggle, for at present, land owners will inflate the real value of their land and will sell only under compulsion. There is, however, a chance that the propheey of soil experts will come true and that agriculturists will be unable to successfully farm the land, under which circumstances they would fail to pay their assessments to the government and ask for a cancellation of their contracts, or at least sell out to those interested in the refuge at a reduced price.

There is no doubt, if we had had the present day sentiment when this drainage project was first proposed, there would still be a Klamath Lake Bird Reservation. The trouble was that few people rallied to the cause at the time, which now appears was the most important time to save the refuge. However, Senator Johnson has shown his interest in the matter, and the Associated Sportsmen's Clubs are working earnestly and prophesy final victory.

The latest information relative to the reflooding of Lower Klamath Lake is as follows:

1. Senator Johnson has shown his interest in the matter and reports that through contracts made by the Reclamation Service the matter is so involved that it seems unlikely of early accomplishment.

2. The time limit for reflooding is not the year 1927, but some ten years or more hence.

3. There seems to be a tendency on the part of government bureaus to "pass the buck."

4. The Associated Sportsmen's Clubs are working earnestly on the matter and prophesy final victory.

MIGRATORY INSECTIVOROUS BIRDS ARE THE FARMERS' FRIENDS.

In the office of the State Department of Agriculture is a collection of dead killdeer which was brought in by the United States game warden, George Tonkin, for analysis of the stomach contents to determine the kind of insects eaten by the birds. Upon examination it was found that the stomachs were filled with grubs and insects injurious to growing crops.

The killdeer is known to be one of the most useful birds on the farm. In this he ranks first among all of his species. The dead birds are a part of a number of killdeer that were shot by Mike Ligitos, a renter, on the property of H. E. Franks on the Garden Highway about eighteen miles north of Sacramento.

Warden Tonkin found Ligitos shooting into bands of killdeer, destroying them by the dozens. Upon questioning, he protested that he was "protecting his crops," not realizing that the killdeer were his best friends and were at that time actually engaged in removing from his fields destructive insects and worms. Evidently he had drawn a hasty conclusion when he saw the birds among his green peas, which were just appearing above the ground.

The grubs and other insects had done serious injury to the young plants. In fact, there were so many insects in the field that a large flock of killdeer had been attracted to the feeding ground. The birds were easier to see and to shoot than the insects to destroy, and Ligitos drew the wrong conclusions. As a matter of fact, if the killdeer had not come on to the field it is quite possible that the farmer would have had no crop.

In this connection, the department wishes to point out that a great many birds, among which the killdeer, robins, meadow larks, flickers, and many other varieties of birds, are the farmers' best friends. The number of insects annually

destroyed by the bands of robins which come each spring saves the farmer thousands of dollars in control measures.

According to Warden Tonkin, the federal laws specifically protect these birds against destruction, and farmers apprehended shooting without a permit are liable to arrest and prosecution.

BEAVERS RAPIDLY EXTERMINATED IN OREGON.

In Oregon beavers are being so rapidly exterminated that it may become necessary to place a ban on the trapping of these animals. A decrease of two-thirds which can be readily seen by noting the difference in the number trapped during two successive seasons, is apparent there. The season of November 1, 1923, to February 29, 1924, yielded 11,111 beaver, while in marked contrast the season of November 1, 1924, to February 21, 1925, resulted in only 3690 being taken. The value of the skins, at the average of $7.50 per skin, amounts to $110,257.50. A report by counties indicates practical extermination the first year in several counties. The Baker County catch dropped from 738 to 140 the second year, and practically all counties halved the catch the second year.

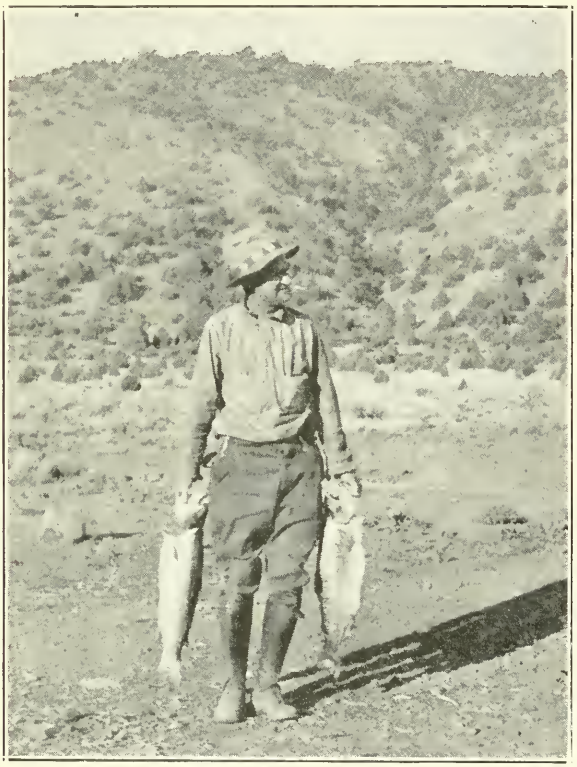


Fig. 21. A 27¼ inch Walker Lake trout caught by Frank E. Briggs. It weighed 13½ pounds. The one in the left hand was less than an inch shorter but weighed 15 pounds. Photograph by J. Saunders.

TO A BOY WITH A GUN.

My Dear Billy:

When you arrive in Florida this winter, you will find a little 20-gauge shotgun, which is a gift from me. While my hair is almost white and it has been a long time since I was a boy and got my first shotgun, yet I think I know just about how you are going to feel. I know that so well, Billy, that you won't have to write a letter to tell me, and I know you couldn't tell it in a letter anyway, so you just take it for granted that I know all about it. After you have been out

hunting or practicing and learn something about hunting and shooting, just sit down some evening and write me a letter.

There are a lot of things I would like to tell you about the use and handling of a shotgun, Billy, that you must know, and I want you to learn them and practice them quickly to justify my belief that you have reached the period in your life when it is proper for you to have a gun. I am always going to feel more or less responsible for what you do with your gun so I am going to ask you to remember a few very important matters. A gun will kill or injure game when pointed right—thus, it might kill or injure persons or live stock, if pointed wrong. The first matter of importance, then, is how to handle a gun with safety to yourself and your companions, or other persons about as well as with safety to property and animals. Never until you have reached a highly developed skill in hunting, carry your gun cocked or with the safety off; this is something I do not do even now, except when in the known presence of game. Always open the gun in getting over a fence or crossing a hazardous place when a fall is possible, and if a fall is likely, break the gun and take out the loads and close it.

Of course, never point the gun loaded or unloaded at any living thing you do not intend to fire at. This means at a person or at dogs or animals. When in the presence of company learn to so handle your gun whether loaded or not that it never points toward a person. Keep it pointed high overhead or low toward the ground. Watch this particularly in turning around among a group of persons and also learn to watch the direction your gun points when carried over the shoulder. When so carried be sure that the muzzle points high overhead and in turning do not let the muzzle sweep around so as to at any time come in line with any person or house or auto or things of that kind. Close attention to these things as you start out, and practice of little tricks of caution and care, soon becomes second nature; indifference to them results in carelessness and accidents, often with fatal results.

It is a real pleasure to feel that you are trusted and to have careful people want to go hunting on any expedition with you, or to be welcome into any party of sportsmen, and the surest way to have this happen is to observe these and other simple rules of caution, at all times and under all circumstances.

If people see that you do not load your gun until you are in the field and unload as soon as you approach a house or place where you are to rest, and in loading and unloading handle it so that it does not point at or toward anyone or an animal, they know at once that you have your mind on what you are doing and that you realize you are handling a dangerous weapon and that you know how. Never leave your gun loaded in the house, car or boat. Never put your gun away dirty; this is a very important "don't," so long as you are in Florida. Always keep it thoroughly covered with oil, or vaseline; have a heavy woolen rag saturated with oil handy, and when your gun is handled remember there is usually some moisture on a person's hands and it causes rust and the metal should be wiped off at once.

Maybe some of these things I have written seem unusual, but I mean them as the usual rule. If hunting ducks from a boat, of course you must have your gun loaded, but not while moving about. A friend of mine, a noted trap shot and representative of an arms and ammunition company, nearly lost his life at Sandusky nearly four years ago. Mr. Blank, at one time champion trap shot of the United States, was hunting ducks at Sandusky, Ohio, with Mr. Blank, one of the best amateur trap shooters in Ohio, and as they returned after the evening shooting, and he was out of the boat and drawing it up on the bank, some flag sticks caught the muzzle of his gun, as it lay across a boat seat, causing it to fall off the seat. It struck something in the boat and was discharged, and the load tore away the inside of his upper left arm and almost tore out his heart. I don't suppose there were ever two men more skilled and experienced hunters than these two men, but with all their care this accident happened. Mr. Blank recovered, but will be crippled all his life.

Now, Billy, get it straight—the real pleasure you will only get when you learn to use a gun right—when you know you are safe and your Dad knows you are safe when you are out with your gun. You won't be safe and he will know you are not safe unless you prove it by practicing these and other rules in the use of firearms and good sportsmanship. Another thing, it is not my wish to make a professional hunter out of you, but there is so much good to be secured, not only to your body, but to your mind as well, in going afield with a gun. This little weapon is not a toy, and yet you must not expect it to do all the killing. Use your brain and your Boy Scout experience and hunt wisely, and the pleasure is not all in what you bring to bag. Am hoping that you go up to the new location

and have a chance to shoot some quail, ducks and rabbits. You can slip down along the shore and get rabbits most any evening. Write me about it. With love,

YOUR UNCLE KENT.

—*Outdoor Life*, November, 1925.

SIX RULES FOR SPORTSMEN.

1. Be a real sportsman. There is more honor in giving the game a square deal than in getting the limit.

2. Make sure it's a buck. If you can't see its horns—she hasn't any.

3. Help to enforce the game law. Game and fish are public property—only a game hog will take more than his fair and legal share. Violations should be reported to the nearest deputy warden, forest ranger, or game protective association.

4. Respect the ranchman's property. He regards as an outlaw the man who leaves his gates open, cuts his fences, disturbs his live stock, or shoots near dwelling. Put yourself in his place.

5. Be careful with your camp fire and matches. One tree will make a million matches; one match can burn a million trees.

6. Leave a clean camp and a clean record. Unburied garbage, crippled game, and broken laws are poor monuments for a sportsman to leave behind him.—An Ideal Vacation Land. U. S. Dept. of Agriculture, 1923.

THE HOMING INSTINCT IN RED SALMON.

The United States Bureau of Fisheries has been conducting some important tagging experiments with red salmon on the Alaskan peninsula. A recent report* brings out the following interesting facts:

Red salmon that were schooling in the vicinity of the Shumagin Islands and in Morzhovoi and Ikatan bays preparatory to their spawning migration found their way when tagged to a large number of different rivers, some of which were located along the southern shore of the Alaskan peninsula, others along its shores in Bering Sea.

Conclusive evidence that salmon return to their native streams was secured by an examination of scales taken from the fish when it was tagged. Certain distinguishing characteristics of the salmon inhabiting the various streams have been demonstrated, and studies showed that the fish were returning to the streams in which they were spawned. Data afforded by the scales was associated with methods of growth, ages at maturity, amount of growth and length of sojourn in fresh water, and other minor characteristics of development which can record themselves on the growing scale.

Two streams in close proximity at their mouths often differ widely in the proportion in which different year classes occur. A considerable percentage of Nushagak fingerlings always descend to the sea when but one year old and they mature and return to spawn at the age of four or five years. On the other hand the Kvichak fingerlings are practically all two or three years old when they enter salt water and they mature mostly at the age of six or seven years. These same differences were indicated in scale studies.

Red salmon captured in any trap in the Shumagin Islands, in Morzhovoi Bay, or in Ikatan Bay on any day during the fishing season contained an assemblage of individuals that had originated in diverse streams, some of which were far distant from the point of capture and others nearer at hand, and that when liberated these salmon proceeded each to the stream of its origin. The theory widely entertained by those engaged in the commercial fisheries—that the salmon constituting the runs to Bristol Bay form an undifferentiated lot and pass into one or the other stream in accordance with the direction of the wind or other external circumstance—is thus seen to be wholly without foundation. There is nothing difficult or abstruse in this problem. The facts speak for themselves to anyone who will take the trouble to examing the evidence. It can not be too soon realized by those interested in the continuance of our salmon industry that each stream is an independent unit, that its salmon runs are maintained if sufficient numbers are reserved for seed and are destroyed if this is not done. The Ugashik, the Egegik, the Nushagak, the Naknek and the Kvichak—each depends for its maintenance as an important salmon stream on the fish that are permitted to spawn within its own watershed.

*Gilbert, Chas. H., and Rich, Willis H., 1925. Second experiment tagging salmon in the Alaskan peninsula fisheries reservation, summer of 1924. Bulletin Bureau of Fisheries, 42, pp. 1-75, illus.

HUNTING LICENSES SWELL STATE REVENUES.

More than 5,000,000 hunting and fishing licenses were taken out during the season 1924-25 by sportsmen and anglers throughout the United States, including Alaska, and the returns to state treasuries amounted to more than $6,400,000. Detailed figures for the season, just com-

piled by the Biological Survey of the United States Department of Agriculture, show increases in the numbers of licenses issued and fees received over the two years preceding. Two years before the licenses numbered 4,341,498 and the fees paid were $5,385,489. One year later 4,395,038 hunters paid for their licenses a total of $5,594,982. During the season 1924-25 the license figures were 5,039,834 and the fees totaled $6,423,276.87. Pennsylvania, with 504,130 licenses and fees of $613,939.30, headed the list both in licenses and returns to the state treasury. The complete figures are given in the following table:

Hunters' Licenses Issued by States for Season 1924-25.

State	*Resident*	*Nonresident*	*Alien*	*Angling*	*Money returns*
Alabama	45,256	138	----	83	$67,136 61
Arizona	26,485	170	----	----	36,479 00
Arkansas	3,926	303	----	----	8,561 90
California	224,601	930	890	----	245,591 00
Colorado	96,844	382	----	6,632	218,294 50
Connecticut	32,399	380	----	----	36,199 00
Delaware	1,502	250	----	----	4,002 00
Florida	(a)				
Georgia	29,030	151	----	----	40,598 75
Idaho	60,780*	542	1	6,232	136,336 80
Illinois	265,064	1,478	----	----	213,578 00
Indiana	163,607	258	----	12,452	180,363 20
Iowa	144,729*	273	----	----	147,459 00
Kansas	109,720	110	----	----	100,226 00
Kentucky	80,774	391	----	----	71,160 03
Louisiana	110,778	337	----	----	124,565 25
Maine	33,863*	3,625	71	422	49,212 95
Maryland	60,516	1,791	----	----	109,524 37
Massachusetts	75,484	802	217	----	122,936 25
Michigan	282,328	2,015	----	----	282,016 26
Minnesota	162,824	698	----	----	217,787 75
Mississippi	(b)				
Missouri	174,699	1,208	----	----	191,922 87
Montana	64,584	154	10	2,958	144,510 50
Nebraska	140,922*	483*	----	2,496	161,129 00
Nevada	3,350	15	----	----	5,175 00
New Hampshire	58,100*	2,550*	----	20,600	130,254 54
New Jersey	138,948*	1,491*	----	5,552	240,584 00
New Mexico	15,260	535	----	8,524	43,426 75
New York	317,384	3,152	----	10,725	345,969 75
North Carolina	(b)				
North Dakota	34,784	277	----	----	55,539 40
Ohio	362,730	66	----	----	454,402 50
Oklahoma	101,135*	322	----	535	108,398 75
Oregon	53,484	638	----	----	199,490 00
Pennsylvania	501,572	2,558	----	----	613,939 30
Rhode Island	11,179	174	74	----	14,029 00
South Carolina	80,442	899	----	----	120,393 00
South Dakota	63,295	2,205	----	4,318	139,672 00
Tennessee	50,806	425	----	----	75,201 94
Texas	71,842	449	----	----	138,295 70
Utah	53,840*	1,063*	----	214	97,481 00
Vermont	38,050*	939*	----	28,816	70,434 10
Virginia	85,888	1,876	4	712	140,789 40
Washington	182,969*	297*	207	3,083	186,561 00
West Virginia (c)	44,850	106	----	----	46,440 00
Wisconsin	180,000	592	----	----	206,600 00
Wyoming	22,266*	3,755	35	19,740	73,644 75
Alaska	(d)	60	26	----	6,964 00
	4,862,889	41,316	1,535	134,094	$6,423,276 87

*Combined hunting and fishing license.
(a) Department of Game and Fresh Water Fish created 1925.
(b) No state commission.
(c) For six-month period only.
(d) No resident hunting license required.

USE BLACK POWDER TO FRIGHTEN BIRDS.

The use of black powder as a means of frightening birds out of vegetable fields and orchards is advocated by George Tonkin, federal game inspector, and the California Department of Agriculture.

"It is against the law to kill many varieties of migratory birds," said Mr. Tonkin; "furthermore, killing often has the contrary effect, as dead ducks or dead geese are frequently observed acting as decoys. Birds are more affected by fright caused by unusual conditions than by the death of some of their own number."

Black powder not only explodes with a loud noise but gives forth a great quantity of smoke which will quickly frighten a flock of birds and drive them off the premises. Black powder shells can be secured in bulk from most of the wholesale powder companies, and will be found a very effective remedy against birds preying upon vegetable fields, says the Department of Agriculture.

Furthermore, the black powder is much less expensive in first cost than the smokeless or sporting powders.

From the standpoint of food value, insect pest destroyers and scavengers, our wild birds are increasing in value to the state as well as to the entire nation. This is probably a greater asset to the farmer than to any other class of citizens. The study of bird stomach contents is continually bringing a greater realization of this value.

MARKET GROWING FOR GAME PROPAGATED IN CAPTIVITY.

The importance of the industry of raising game birds in captivity must be judged from the standpoint of both production and consumption of the products, as is the case with the poultry industry in general. According to the United States Department of Agriculture there are more individuals directly interested in keeping and breeding fowls than in the production of any other class of animals or any class of plants. The birds produced in this way include not only chickens, turkeys, and guinea fowl; but also pheasants, peafowl, ostriches, and migratory waterfowl—ducks, geese, and swans—and these are raised in all parts of the United States and under a great variety of conditions. To a discussion in the latest Yearbook of the Department of Agriculture on the economic importance of the poultry industry in the United States, W. L. McAtee of the Biological Survey has contributed the following chapter on "The Game Poultry Industry":

In the United States the game-bird market has undergone a complete change within a generation. Formerly this market was as well supplied both in quantity and variety as any in the world, the game consisting entirely of wild birds. Now, after almost complete elimination for a period of years through legal restrictions, the game-bird market, although enormously decreased, is gradually growing. The birds marketed, however, except for certain imported species, are for the most part propagated in captivity.

Between 1870 and 1880 the passenger pigeon was shipped literally by the carload, and a single consignment of prairie chickens to a New York dealer weighed 20 tons. Wild ducks by the tens of thousands were poured into the game markets from all the important hunting grounds of the country. It gradually became evident that an increasing demand, easily catered to because of improved facilities for shipping and marketing, was rapidly depleting the wild stock. Conservation laws multiplied, sale was prohibited, and through a final enactment, the federal migratory-bird treaty act of 1918, the market for wild game birds in the United States was practically closed.

This law, as well as those of numerous states, has provisions designed to permit and encourage artificial propagation of game birds and their marketing under restrictions intended to prevent drafts on the wild stock, such as our former experience proved to be incompatible with its maintenance. Such legislation has developed unevenly, as is usually the case when the 48 states act independently. No fewer than 28 states have fair to good laws on the subject, and at least 12 others have made a beginning. The problem is a difficult one, and game breeders should realize that there is no disposition to hamper them; rather the almost universal desire is to encourage them so far as can be done without endangering our present standard of protection of wild game.

The propagation and sale of migratory waterfowl (that is, wild ducks, geese, and swans) is legal under regulations issued by the secretary of agriculture, and thousands of persons have obtained permits issued by him to possess, propagate, and sell birds of this class. Recent figures compiled show that in one year 4291 game breeders reared approximately 42,800 birds, of which about 12,200 were sold for propagating purposes (including those used for decoys), 10,100 for food, and 8000 were eaten at home.

The breeding of nonmigratory game birds, such as pheasants and quail, is under state regulation, but statistics as to the extent of the industry are very unsatisfactory. State game departments in a number of instances rear and distribute many pheasants, but this activity can not be reckoned in estimating the commercial

importance of the propagation of these birds. Definite totals can hardly be attempted with present knowledge of the subject, but the statement may be ventured that the 13,100 pheasants, exclusive of importations, sold for food in New York and New Jersey in 1922 exceeded the number sold for such use in other states. The number sold for propagating and stocking purposes doubtless is far larger, but definite figures have not been obtainable. So far as individual propagators are concerned, the data available would indicate that, while fewer are engaged in the culture of upland than of aquatic game birds, the numbers of these birds sold for propagation and for food are somewhat larger.

Under present conditions the market for artificially propagated game birds is mainly with those desiring to engage in rearing the birds and with sportsmen who wish to use them for decoys and for restocking shooting coverts. Prices realized from these sources are so high that only a limited demand exists for the birds for table use, mainly by the most luxurious hotels and clubs. So long as the demand for decoy, stocking, and propagating birds absorbs most of the output at fancy prices, it is not likely that production of birds for food will become much more important than it is at present. However, should the rearing of game birds continue to increase, prices would decrease and a more general market could be established.

FEDERAL BAG LIMITS REDUCED.

The federal daily bag limits on a number of migratory game birds have been reduced under an amendment to the migratory-bird treaty act regulations adopted by the secretary of agriculture and approved by the president on March 8. Hunters who formerly enjoyed a limit of not to exceed 25 Wilson snipe or jacksnipe a day may take only 20 under the new regulations when the fall shooting season arrives. The limit on sora has been reduced from 50 birds a day to 25. On rails and gallinules, except sora, a bag limit is prescribed of 25 in the aggregate of all kinds, but not more than 15 of any one species. A daily bag limit of 25 is fixed for coots. The season on black-billed and golden plovers is closed indefinitely. These reductions and close seasons apply throughout the country, regardless of any state law which may allow greater privileges.

In addition to the above, changes were made in the open season for hunting waterfowl in Illinois, Indiana, Kentucky, New Mexico, eastern Washington, and the counties of Nantucket and Dukes in Massachusetts. In Illinois, Indiana, and Kentucky the open season was changed from September 16 to December 31 to the period October 1 to January 15; in New Mexico from October 1 to January 15, to the period October 16 to January 31; in eastern Washington from September 16 to December 31, to the period October 1 to January 15, and in the counties of Nantucket and Dukes in Massachusetts from September 15 to December 31 (which will continue as the open season for the remainder of the state of Massachusetts) to the period October 1 to January 15. These seasons apply to waterfowl (including ducks, geese, and brant) and to coots, gallinules, and Wilson snipe or jacksnipe, but the close season continues on wood ducks, eider ducks, and swans.

All the amendments were recommended by the Bureau of Biological Survey of the Department of Agriculture and concurred in by the advisory board, migratory-bird treaty act, before being adopted by the secretary of agriculture.

FACTS OF CURRENT INTEREST.

Lassen and Modoc County sportsmen are advocating shortening the season on sage hens to five days.

The Associated Sportsmen's Club of California has succeeded in welding the various protective associations into a strong organization which should greatly aid in carrying out California's conservation program.

During the 1925 tuna canning season 34,238,813 pounds of fish arrived at the canneries in Los Angeles harbor, and more than 6,000,000 additional pounds went to other canneries of Los Angeles County.

Final arrangements are being made for the building of a hatchery in Yosemite National Park. At a recent meeting an agreement between the National Park Service and the California Fish and Game Commission was signed and plans are being matured.

Demands for the use of the commission's educational films are continually growing. In several instances farm advisers have used films for several weeks at a time in connection with farm bureau meetings. These educational films are carrying a conservation message to an increasing number of persons annually.

The commissioners have been active in giving talks at fish and game protective association meetings. They are so whole-heartedly in the work that they give freely of their time to meetings of this kind.

During the latter part of April several dozen pheasant eggs were being gathered daily from the breeding pens at the Yountville Game Farm. During May hatching will begin and the rearing pens will soon be in use.

Construction will begin during May of a new hatchery building to replace one impossible of restoration on the Mount Shasta Hatchery grounds. This is the major project in connection with the extensive program of repair and restoration of hatchery equipment now under way.

Complaints relative to pollution have been so many and the need of investigation so great that the Bureau of Pollution has employed a chemical expert who will be in direct charge of pollution cases. Already numerous complaints have been investigated and many tests made.

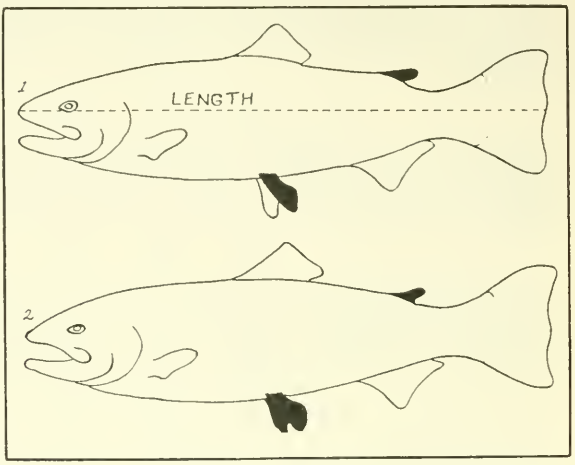
WATCH FOR MARKED SALMON.

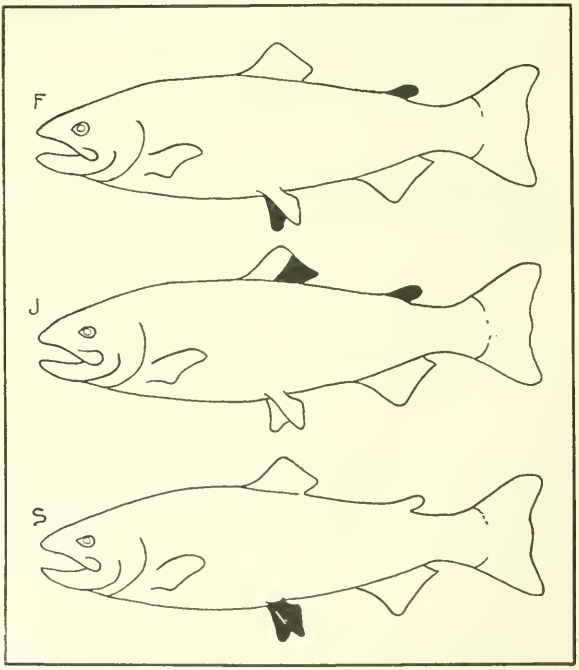
NOTIFY AUTHORITIES IF YOU CATCH FISH WITH PARTS OF FINS MISSING.

During the season of 1926 marked salmon will be caught in the Sacramento and Klamath rivers and along the coast. Some of these will have either the adipose and left ventral fins removed as in figure 1, or the adipose and both ventrals cut away as in figure 2.

The first of these groups was marked at Fall Creek and liberated in Klamath River in the fall of 1922. The second was marked at Sisson at the same time and liberated in the Sacramento River.

Others were marked by cutting away the adipose and right ventral fins as in figure F, the adipose and posterior half of the dorsal fins as in figure J, or both ventral fins as in figure S. These fish were marked at Fall Creek in 1923 and liberated in the Klamath River as described in CALIFORNIA FISH AND GAME, Vol. 10, No. 1, page 9.





It is requested that anyone who secures one of these fish measure its length from the tip of the snout to the middle of the caudal fin, determine the sex, cut each mutilated fin from the body, scrape a hundred or so scales from the side of the body, write down the length, sex, date and place of capture, his own name and address, and mail all this to the State Fish and Game Commission, San Francisco. The fins should be well salted. The scales may be spread out between two pieces of paper. The commission will pay 50 cents for such data relating to each fish if it proves to actually be a marked individual, and so determined by a scientific assistant of the commission.

The marking of these fish is a feature of a program of scientific investigation on the part of the Fish and Game Commission relating to the habits and life history of species of economic importance. The results of such investigations contribute toward conservation and maintenance of the fisheries, and it is hoped that fishermen, dealers, packers and consumers will cooperate when opportunity offers.

COMMISSION ACTIVITIES.

At the last civil service examination for deputy fish and game commissioner, on March 5, approximately 150 candidates took the examination. This number included temporary employees.

During the months of February and March, 107 arrests were made and fines totaling $5,685 were imposed. Numerous seizures of illegal fish and game were made, including 168 pounds of striped bass. The heaviest fines imposed were those of $250 each on two fishermen for using illegal nets in the Sonoma River.

Forty-four dollar-a-year deputies have been appointed and more are to be appointed in the immediate future.

The numerous news items issued by the Bureau of Publicity are being used by more than two hundred newspapers. Adequate newspaper publicity is now being attained.

A mimeographed "Service Bulletin" now goes to all employees at monthly intervals. It contains information relative to more efficient and unified handling of conservation work.

Patrol districts under competent captains have been created as follows:

Mount Shasta—Wm. M. Lippincott---------- Yreka
(Counties of Siskiyou, Shasta, Modoc and northeast Trinity)

Sacramento Duck—S. J. Carpenter---------- Maxwell
(Counties of Tehama, Glenn, Colusa, Butte, Sutter and the southwest corner of Yuba)

Sacramento—D. E. Roberts---------- Murphys
(Counties of Sacramento, Yolo, El Dorado, Amador, Calaveras, San Joaquin and eastern Solano)

San Joaquin—J. E. Newsome---------- Newman
(Counties of Madera, Mariposa, Merced, Stanislaus and Tuolumne)

Fresno—E. W. Smalley---------- Stanford
(Counties of Fresno, Kings, Tulare and Kern)

San Francisco—M. S. Clark---------- San Francisco
(Counties of San Francisco, Alameda, Contra Costa, San Mateo and Bay patrol)

Los Angeles—C. S. Bauder---------- Los Angeles
(All the counties of southern California)

There has been prepared by the Department of Fishculture a list of all screens and ladders which have been ordered installed by that department over a long period of years, and a further list of those streams where such installations are necessary and where orders

have not been made. Also a letter has been forwarded by the chief patrol officer to every deputy, instructing him to make a personal survey of his district and report the present condition of all screens and ladders and all places where new installations are necessary. These reports are now coming to hand and within the next few weeks the commission will be in a position to enforce the screen and ladder law in a way never heretofore attempted. Many individual instances of inadequate screens and ladders have already been investigated by the commission.

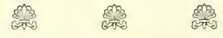
Owing to the depth of snow on the high Sierra passes, difficulty will be experienced this year in reaching the Rae Lakes Egg Collecting Station sufficiently early to secure a good take of eggs.

Mr. George Coleman, biologist, is making a biological survey of conditions of Lake Tahoe and tributary streams. The work will be continued throughout the summer.

The old Kaweah temporary hatchery located at Power House No. 1 is being moved to a new site three miles farther up the river, where the water will be tested this summer as to its suitability for fish-cultural purposes. If the water proves satisfactory, arrangements will be made to construct a permanent hatchery on this site.

Although the total catch of sardines has been less than that for last season, yet the pack will show an increase of 25 per cent, amounting to something over two million cases.

A fish bulletin detailing the results of the sardine investigation carried on by the State Fisheries Laboratory is now ready for press. The bulletin represents only part of five years of work, but it is expected to form a distinct contribution to the science of fisheries conservation.



A biological investigation of striped bass has been carried on during the winter to determine the age, and rate of growth, also the size and age at which bass mature, and to secure data upon which to determine the proper minimum mesh of nets to be used. Microscopical studies of the scales have greatly aided in the studies.

A very important conference was held at Bakersfield on March 23 at the office of the horticultural commissioner relative to predatory animal control in game refuge 1-M. Sheep herders maintaining that coyotes from the refuge prey upon their sheep, asked permission to use poison to exterminate them. Acting upon the policy adopted by the cabinet in regard to predatory animal control, opposition was made to the use of poison pending completion of a comprehensive

report now being prepared by Mr. Joseph Dixon. In the interim the commission will allow trapping of coyotes under the direction of the Bureau of Biological Survey. The decision was satisfactory to county officials.

During the past winter 3,765,000 salmon eggs were hatched at the Fall Creek Hatchery. Of this number 1,165,000 were liberated in the Klamath River during the month of March. About half of the remainder will be held in the ponds for fall planting.

At the Fort Seward Hatchery there are 1,697,000 young salmon on hand and in fine condition.

Trout spawning operations on the Klamath River progress satisfactorily during the spring. Spawning fish did not appear in very great numbers early in the season, owing to low water.

Up to April 1, 1,182,000 trout eggs had been secured at Bear Lake and were being hatched in the Bear Lake Hatcheries. Eggs were secured from Kidd Creek, Grout Creek, and North Creek.

Mr. R. J. Irvine has been employed by the Bureau of River and Harbor Pollution to conduct investigations relative to pollution and to make chemical tests as to the quantity of pollution. All the known sources of stream or bay pollution in the San Francisco Bay region have been visited within recent weeks and reports made.

Pollution by crude oil has been found to be one of the most serious problems before the pollution bureau. This is caused largely by improper cleansing of wastes from large oil refineries. Still another serious problem is that of tannery and distillery wastes. Two important investigations of these problems are under way at the present time. In several localities reports of pollution, due to discharge of crank case greases and oils by garages through city sewer systems, have been investigated, and recommendations for solution or improvment of the situation made to Major Rolin G. Watkins, director of the pollution bureau.

By the end of March, Superintendent Bade of the Yountville Game Farm was collecting six dozen pheasant eggs daily. During April nearly double that number were being laid. Incubators as well as hens are being used in hatching operations. The breeding stock of ring-necked pheasants numbers 256. Four other varieties of pheasants are to be found in the pens, together with a few Hungarian partridges and valley quail.

During the past few months many calls have come in for employees to address various organizations, notably fish and game protective associations. New policies and problems confronting the commission

have been frankly discussed with the sportsmen of the state. The following report indicates the extent of this activity:

Date	Auspices	Lecturer	Attendance
Mar. 2	Garfield P. T. A., Berkeley	Bryant	185
Mar. 4	S. F. Aquarium Society, San Francisco	Scofield	50
Mar. 4	Sardine Exporters, San Francisco	Greene	20
Mar. 11	County Supervisors Convention, San Diego	Bryant	235
Mar. 11	San Joaquin Fish and Game Protective Assn., Stockton	Zellerbach Greene Hunter	350
Mar. 16	Los Gatos Fish and Game Protective Assn., Los Gatos	Greene Hunter	80
Mar. 18	University High School, Oakland	Bryant	650
Mar. 18	Berkeley Evening High School, Bekeley	Bryant	130
Mar. 20	San Diego Fish and Game Protective Assn., San Diego	Greene Hunter	21
Mar. 23	Lindsay Fish and Game Protective Assn., Lindsay	Zellerbach Greene Hunter	776
Mar. 24	Stanislaus-Tuolumne Counties Fish and Game Protective Assn., Modesto	Zellerbach Greene Hunter	400
Mar. 27	Santa Cruz Rod and Gun Club, Santa Cruz	Zellerbach Scofield Greene	300
Mar. 31	Gilroy Game Protective Assn., Gilroy	Watkins	50
Mar. 31	Camp Fire Girls, Berkeley	Bryant	10
			3257

For three years Chas. Latieze, of 115 Bernard street, and Leon Coudere, of 1351 Mason street, San Francisco, played at "hide and seek" with fish and game wardens. In all that time (despite their belief that the men were violators of the fish and game laws), the wardens were unable to "catch them with the goods." Every time they were approached it was found that they had previously gotten rid of their illegally taken catch of fish.

The chase came to an end on the Pescadero road April 25, when Patrol Captain M. S. Clark and Patrolman Jack Burke, of the Fish and Game Commission, overtook the pair, and, searching their car, found 78 trout hidden in the bottom of boxes of lettuce and artichokes they were bringing up from Latieze's ranch. Justice of the Peace Ellis C. Johnson completed the story when he fined Latieze $200 in his court at Daly City the following morning. Latieze pleaded guilty to the charge against him and accepted responsibility for possession of the fish.

COMMERCIAL FISHERY NOTES.

By N. B. Scofield, Editor.

FISHERY STATISTICS FOR 1925.

Statistics compiled by the Commercial Fisheries Department of the Fish and Game Commission show a large catch of fish for the year 1925. The total of all fish taken in California waters in 1925 (exclusive of mollusks and crustaceans) was 404,002,066 pounds. Mollusks and crustaceans contributed 10,751,246 pounds, bringing the total up to 414,753,312 pounds. To this may be added 12,045,512 pounds taken in Mexican waters and brought to the canneries and markets at San Pedro; and 10,078,075 pounds taken in the same area and landed at San Diego, for a total of 22,382,587 pounds of "immigrant" fin-bearing beauties. The gross total of all fish handled by California market fishermen during the year is thus given as 218,567.7 tons.

Some fish! The figures thus given out show a gain of slightly in excess of 28 per cent over the figures of 1924.

The greatest gain in any one species is that of the skipjack (*Euthynnus bonito*), a fish of the mackerel family and somewhat similar to the tunas. The total figure for this variety in the year 1925 was but 8,768,114 pounds, but this was an increase of 546 per cent over the catch of the previous year. From a position of no importance in 1924 the skipjack rose to that of fourth in all fish taken (other than sardines) in 1925.

The sardine, California's greatest commercial fish, showed a total of 315,294,986 pounds taken in 1925, an increase of 29 per cent over the 1924 catch. This variety comprised 78 per cent of all fish taken in California waters last year. The sardine take was 72,609,028 pounds greater than that of the year 1924.

The albacore and other tunas, classed as California's second most interesting fish crop, increased at the rate of 33 per cent in 1925. Something over 5000 tons of this variety came into San Pedro and San Diego from Mexican waters. The California take was 28,837,702 pounds.

The salmon, for many years one of California's largest fish crops, fell off 5 per cent last year. The total catch for the year was 9,525,753 pounds. The catch in striped bass increased 26 per cent, with a total of 837,773 pounds.

The smallest take in the state commercial fish crop was that of steelhead trout *(Salmo irideus)*, of which 222 pounds were taken in California waters. Mexican waters contributed none of this variety.

Among the other varieties showing a decrease in 1925 were: yellowtail, white sea bass, sculpin and white bait. These decreases ran from 10 to 42 per cent.

Shad, which is taken only in the Sacramento River and its tributaries, showed an increase of 80 per cent. The total catch was 2,439,826 pounds.

Flatfish, including halibut, flounder, sole and sand dabs, increased but 2 per cent. Mackerel increased 8 per cent.

Among the crustaceans the 1925 take of crabs increased by 100 per cent. The take of spiny lobster increased 43 per cent. Mollusks showed little or no change. Abalones increased from 2,241,812 pounds in 1924 to 2,352,866 pounds in 1925.

An interesting sidelight on the figures thus made public is that San Pedro leads all other state ports in fish tonnage. The total landed there in 1925 was 218,086,323 pounds. Monterey ranks second with a total of 132,226,106 pounds. Sardine canning operations at both those ports are declared to be the cause of this condition.

The figures can best be appreciated by comparing them with those of such fishing ports as Boston, Gloucester and Seattle, where the fish catch landed during the same period was 149,038,498, 49,471,954, and 32,394,460 pounds, respectively, according to figures of the Federal Bureau of Fisheries.

SALMON TO BE TAGGED ON CALIFORNIA COAST.

In cooperation with British Columbia, the United States Bureau of Fisheries and the states of Oregon and Washington, the Department of Commercial Fisheries is undertaking the tagging of 2000 salmon caught by trolling along the coast of California. Representatives of the Fish and Game Commission will go out with the trolling boats and purchase the fish from the fishermen as they are caught. A numbered metal tag will be securely clamped to the tail of the fish and it will be immediately returned to the water.

The object of this experiment is to determine the migration of the salmon. It is expected to furnish some interesting results, for last year British Columbia did some tagging to the westward of Vancouver Island and two of the fish tagged there put in an appearance in the Sacramento River, California, and over fifty were recovered in the Columbia River. As salmon are known to return

to their parent stream for the purpose of spawning, the capture of the two tagged salmon in the Sacramento River is evidence that our Sacramento salmon wander far afield, which brings about interstate complications and international complications as well.

A reward of 50 cents is being offered for each tag returned to the Fish and Game Commission with information concerning where the fish was taken and the date and method of capture.

NEW MEXICAN TREATY INCLUDES FISHERIES REGULATION.

The following is from an article appearing in the April, 1926, issue of the *Pacific Fisherman*, and is of interest to the commercial fisheries industry in southern California:

"The new treaty recently negotiated between the United States and Mexico, which is expected to become effective in the near future, provides for a more definite policy in the regulation of international fisheries adjacent to the boundary of the two countries, and is expected to bring about more satisfactory conditions in the Lower California fishery whose product goes mainly to United States markets. Provision is made for a commission to consist of two representatives of each government, whose unanimous recommendations will serve as a guide for cooperative legislation. The treaty also takes up narcotics and immigration questions, which have occupied public attention to the exclusion of the fishery features.

Owing to the great interest of California in the border fisheries, N. B. Scofield, chief of the Commercial Fisheries Department of the State Fish and Game Commission, was some time ago called to Washington for consultation on the matter. A question arose as to whether the terms of the treaty might not tend to transfer a measure of the state's control of its fisheries to the federal government; but under the wording adopted there seems to be little possibility that this would occur. On the other hand, the treaty is expected to be highly advantageous to the southern California fish packing industry, as well as to Mexico, which derives a large revenue from American fishing operations based at Lower California ports.

It is understood that there has in the past been some lack of uniformity in the administration of the fisheries in Lower California; the export tax on fish is nominally $30 per ton, but it is believed that some operators have been paying only half that amount, and considerable poaching also has been done. The treaty is said to provide that all fishing boats will be required to clear from ports of the country in whose waters they have been operating, which will facilitate the uniform collection of duties and place operators on an equal footing. It is thought possible, also, that the treaty may result in a reduction of the tax. In view of the various advantages, Mr. Scofield feels that the treaty will be of benefit to both countries in so far as it deals with fishery matters."

Advice from Washington states that President Coolidge has approved the names of Henry O'Malley (chief of the United States Bureau of Fisheries) and N. B. Scofield as the two commissioners on the International Fisheries Commission—United States and Mexico—to represent the United States.

PATROL BOAT ALBACORE GETS NEW ENGINE.

The gasoline engine in the patrol launch Albacore, in southern California, which has seen eight years' service, is being replaced by a 65 h.p. full Diesel black oil engine.

LIFE HISTORY NOTES.

MOUNTAIN SHEEP TAKEN CAPTIVE.

Sportsmen of the San Joaquin Valley were much interested last winter when reports were received that a strange animal had been seen near Woody, Kern County. This animal resembled the domestic ram except that it had a body somewhat like a deer and a head like a sheep. It was first reported by a motorist who saw it standing by the side of the road. A day or two later it was seen near Glenville, about eight miles east of Woody. The following day, Mr. Benton Martin, while looking for cattle near his ranch, saw this animal, and with the aid of his dogs succeeded in roping and taking it home.

This animal, which proved to be a mountain sheep, seemed to be at home in its new surroundings and was allowed to run loose in Mr. Martin's barn and corral, from which it escaped during the night. However, several pictures were taken of this sheep, one of which is reproduced herewith.

Many reports are received that mountain sheep have been seen in the high mountains of Tulare County, but the

only report verified was when Dr. Joseph Grinnell was called as an expert witness in a case involving the killing of a mountain sheep near Milo, in Tulare County. That sheep, a female, and the ram described above are the only ones of actual record for this county in years.

Old hunters state that mountain sheep were formerly plentiful in the Mount Whitney and Kern River country, but none have been seen in recent years.

Mountain sheep are not uncommon in eastern Inyo County, and many wonder if this specimen, caught at least 75 miles as the crow flies from its natural habitat, is one of the Inyo sheep strayed from its home in the desert, or if it had been held in captivity and had escaped and was heading for its home when discovered and caught; or if this is one of the survivors of the bands that once roamed the high mountains of Tulare County. The last theory seems the most probable, as this sheep has not been seen since its escape two months ago, showing that it still retained its inherited cunning.

Cattlemen and sportsmen have been requested to report any information in reference to this sheep, and it is hoped that more will be heard later.—O. P. Brownlow, Porterville, California.

INVESTIGATIONS OF DEER DISEASE IN MENDOCINO COUNTY.

During the past winter numerous reports have come from Mendocino County that deer were dying from some sort of disease and that most of these deer were young. An investigation made by Roy Ludlum of the Fish and Game Commission leads to the view that at least some of the stories were unfounded; in fact that perhaps they were started purposely to keep hunters out of certain territory. One man who reported many deer sick, admitted when questioned that there were only a few specific instances. Most of the newspaper items were evidently based on information furnished the Biological Survey by this man. In the Island Mountain region, the particular area covered in the investigation, there was no indication that any great number of deer had died from an epidemic.

A report by Frank Clarke, who made studies of the deer disease in Trinity County several years ago, is to the effect that a considerable number of young deer died in the vicinity of Laytonville, and he explains their death as follows:

"The fawns got a bad start last summer. There was an abundance of native grasses. The quantity was unusually

FIG. 22. Stray Sierra mountain sheep discovered and photographed near Woody, Kern County. It is a very rare instance when a mountain sheep wanders so far below timber line. Photograph by B. Martin.

great, while the quality was lacking. Permit me to cite my own business. The calves and lambs that were born in February and early March got a good start and developed at about an 85 per cent rate, while those that came in April or May (just a few dozen in my case) were almost 'useless' unless put in an alfalfa field during the summer.

Up here we had a great deal of rain during April, May and June. The grasses grew to unusual heights. Nature fulfilled its mission in that case: coarse stalks and seed. But nutriment was lacking proportionately, while fiber and acid predominated. Having exhausted themselves, the plants did not furnish any late green seed. The mass of stuff fell down and in general a great deal of it moulded and rotted.

These conditions prevailed in this section of the country: domesticated stock did not fatten well, and, as I have stated above, the late born did nothing without unusual help. The fawns come here about May. Last season they fared like everything else, maybe worse. The acorn crop here was very light; but autumn came early and winter was mild, otherwise the deer would have fared badly. There was what the ranchers call 'fine feed' all winter. But the young deer didn't seem to thrive. They came out into the grass, ate heartily, got diarrhœa, and many of them died. The rations they got during the first months of their existence were doubtless lacking in vitamines. In this instance I do not believe there was any definite disease, at least nothing which could be controlled. I believe the present trouble is one that occurs nearly every year, sometimes worse than others. The popular opinion among old timers, like my father, is that during winters of abundant rank growth of grass like this past winter, the deer will be affected with 'scours.' This seems to be true especially when there is lots of clover, green and rank. I remember that the winter of 1900 and 1901 was warm and wet. There was abundant feed and the deer got sick and died everywhere. That time the grown deer were affected as well as the young ones. We had a man building a fence at that time. He and his family nearly starved because the deer were too thin to eat. He hunted all over the country and found plenty of deer, sick and dying. He was a careful observer and did not exaggerate.

It is claimed that the fawns are born later in the spring now than they were years ago. This seems reasonable when we consider that 'stocking' the country has literally killed out certain plants that formerly furnished green feed for deer all year around. The depletion of their normal foods naturally hampered their nutrition and growth. A female under impaired conditions does not usually breed as soon as one under favorable conditions."—H. C. Bryant, Berkeley, California.

REPORTS ON ANTELOPE FAVORABLE.

During the past year numerous antelope have been seen in Secret Valley, Lassen County, and several small herds have been reported regularly in Modoc County near Alturas. One herd said to have numbered but six a few years ago contains twenty-two at the present time.—H. C. Bryant, Berkeley, California.

SISKIYOU COUNTY PAYS A BOUNTY ON COYOTES.

On November 15, 1925, Siskiyou County placed a bounty of $5 each on coyotes. Between that date and January 31, 1926, trappers have collected bounty on 522 coyotes. A greater portion of these coyotes were caught in the Scott River basin. This part of Siskiyou County is our best deer country, and these coyotes have taken a heavy toll in the past two years. A large number of wild cats have been taken this winter, some extra large ones.—Wm. Lippincott, Yreka, California.

SALMON FAVORED BY UNUSUAL CONDITIONS.

The past season salmon have had a better chance than usual to run the gauntlet of fishermen's nets in Carquinez Straits. The abundant rain brought on freshets which made conditions impossible for the laying of nets. Then during April a strike of fishermen gave a chance for another run of salmon to reach their spawning grounds. Of course this is just in addition to the regular opportunities afforded salmon through a close season, a one day a week, when nets are not allowed in the river. That salmon still grow to be of large size is evidenced by one taken on April 20, 1926, at Sutterville, which weighed 66 pounds.—W. J. Green, Sacramento, California.

STURGEON ON INCREASE.

The sturgeon is the only fish in the State of California given total protection by law; furthermore, this fish is one of the largest fishes found in fresh water. Originally very abundant, its numbers were decimated by Chinese who used set lines. A further factor is to be found in the fact that the eggs are the basis of that delectable dish of the epicure—caviar.

For a number of years past the sturgeon has seldom been seen in streams; however, during the last year complaints by Sacramento River fishermen have been on the increase. This big fish occasionally strikes a salmon net, causing considerable damage. Fishermen near Rio Vista have also reported seeing this large fish occasionally break the water. It is to be hoped that these reports really mean that this fish is again on the increase.—W. J. Green, Sacramento, California.

CONSERVATION IN OTHER STATES.

OREGON HAS NEW BAG LIMIT ON TROUT.

At the request of sportsmen who are vitally interest in maintaining angling in the lakes of the central Oregon district, the bag limit on trout has been reduced by the game commission to thirty fish or fifteen pounds and one fish in one day; and sixty fish or thirty pounds and one fish in any seven consecutive days.

ILLINOIS EXTERMINATING WOODCHUCKS.

It has become necessary for the state of Illinois to employ poison as a means of ridding itself of woodchucks. This is against the law, as no wild game or other animals even when found destroying property may be poisoned. However, the Department of Conservation has now authorized the farmers to use cyanide of potassium, but only under the direction of an expert or representative of the department. Many fur-bearing animals inhabit the home of the woodchuck, and it is for this reason that this care must be taken, and only the expert is able to detect the presence of these animals.

OREGON CLOSES CERTAIN LAKES.

Oregon has determined upon a policy of closing certain depleted lakes and streams to anglers for a period of ten years. It is understood, however, that any of these streams may be reopened when requested by organized sportsmen of the counties in which the streams are located. In this we see an extension of the refuge idea to fish. As a rule a stream and all of its tributaries are closed by an order of the State Game Commission. In Klamath County five streams and four lakes have been closed to the angler, together with a section of the Klamath River and a small area on Link River below a dam. About sixty lakes and streams have been closed in Lane County. Many of the small mountain lakes which formerly contained no fish life, but which were recently stocked, have also been closed for a period of three years. It is evident, therefore, that an extensive program has been mapped out.

MISSOURI INCREASES REFUGE SYSTEM.

Missouri began a game refuge system about two years ago with the purchase of one 12,000-acre tract and another 5000-acre tract. Now comes the announcement of the establishment of a game refuge of 2000 acres of virgin timber land in Mississippi County. A single strand of heavy galvanized wire will surround the sanctuary. Along this wire metal signs will be hung at intervals of 100 yards, "Trespassing at any time for any purpose is unlawful." This 2000-acre enclosure will be the cover for wild animal life and will be left in its natural condition and undisturbed except for an occasional inspection trip of the refuge keeper.

Feed will be furnished birds in the form of grain which will be planted in certain places and left to grow. A public-spirited citizen donated the area to the state of Missouri.

PENNSYLVANIA ISSUES EDUCATIONAL BULLETIN.

The Board of Game Commissioners of Pennsylvania has just issued a bulletin entitled "Year's Program for Bird Protection" by George M. Sutton, chief of educational service. In the introduction it is pointed out that an educational service with a trained ornithologist in charge has been established. The new bulletin is designed primarily for use in the public schools of the state. The friends of bird life, the enemies of birds and methods of protecting and attracting bird life are the main subjects treated. Attractive photographs are used in illustration.

MISSOURI CLOSES SEASON ON DEER.

Missouri's remnant of deer have been reduced to only 395, due mainly to the great inroads made by dogs. There is to be a closed season on deer for five years, during which period it is hoped to increase the deer population of the state. This can only be done with the additional cooperation of the fox hunters, the owners of the dogs.

ILLINOIS LICENSES HUNTING CLUBS.

At a recent meeting of the Illinois General Assembly many changes were made in the game and fish code. Of particular interest is section 27*a* on hunting clubs. This new regulation requires any person or club holding land for the purpose of hunting migratory birds to make application to the Department of Conservation and pay a license fee of $10. An accurate daily register must be kept showing number and kind of migratory birds killed, which shall be open to inspection to persons having authority to enforce the game laws of Illinois. If no record is kept by one hunting on a private reservation he can be held under the contention that all game in possession was shot in one day.

Persons not hunting on a reservation will not have to keep daily records, but they can not exceed the daily limit of migratory birds.

INDIANA'S EDUCATIONAL WORK.

The conservation commission of Indiana hires a school lecturer whose duty it is to give conservation lectures at the various schools of the state. Part of this lecturer's salary is paid by the Audubon Society. With a fully equipped Ford and lantern, this man is able to reach practically all of the schools of the state. His aim is "to make sportsmen conservationists out of mere killers."

STATEMENT OF INCOME.

October, November and December, 1925.

	Detail	Total
License sales:		
Angling	$55,262 00	
Hunting	75,463 00	
Market fishermen's	4,860 00	
Trapping	2,247 00	
Wholesale fish packers' and shell fish dealers'	325 00	
Game breeders'	30 00	
Total license sales		$138,187 00
Other income:		
Court fines	$17,736 00	
Fish packers' tax	23,794 82	
Kelp tax	1 20	
Fish tag sales	829 81	
Game tag sales	26 44	
Interest on bank deposits	724 06	
Sale of nets and twine	150 00	
Total other income		$43,262 33
Total income		$181,449 33

STATEMENT OF EXPENDITURES.

For the Period October 1, 1925, to December 31, 1925, of the Seventy-seventh Fiscal Year.

Function	Materials and Supplies	Salaries and Wages	Service and Expense	Property and Equipment	Total
Administration:					
Commissioners			$27 55		$27 55
Executive offices	$142 33	$5,454 99	1,156 19	$84 72	6,838 23
Printing	2,772 05				2,772 05
Research and publicity	24 55	1,095 00	204 90		1,324 45
Accident and death claims			807 30		807 30
Department totals	$2,938 93	$6,549 99	$2,195 94	$84 72	$11,769 58
Commercial fish culture and conservation:					
Superintendence	$185 70	$2,637 10	$1,261 61		$4,084 41
Inspection and patrol	944 69	8,240 23	1,776 12	$66 99	11,028 03
Research	616 32	2,617 50	805 81	31 55	4,071 18
Statistics	10 96	2,023 38	143 84		2,178 18
Propagation and distribution of salmon	5,470 29	4,448 33	333 94	71 36	10,323 92
Department totals	$7,227 96	$19,966 54	$4,321 32	$169 90	$31,685 72
Sporting fish culture:					
Superintendence	$17 47	$2,575 00	$578 64	$3 50	$3,174 61
Special field investigations		129 03	54 17		183 20
Propagation and distribution of trout	15,559 21	12,358 69	2,438 10	174 03	30,530 03
Department totals	$15,576 68	$15,062 72	$3,070 91	$177 53	$33,887 84
Patrol and law enforcement:					
Prosecutions and allowances			$12 98		$12 98
General patrol	$622 96	$35,413 89	23,471 57	$108 75	59,617 17
Fish and game conservation:					
Game bird introduction			$0 50		$0 50
Game farm	$203 80	$350 00	152 58	$929 05	1,635 43
Mountain lion hunting		375 00	385 12		760 12
Mountain lion bounties			1,180 00		1,180 00
Department totals	$826 76	$36,138 89	$25,202 75	$1,037 80	$63,206 20
License commissions			$16,565 30		$16,565 30
Total Fish and Game Commission	$26,570 33	$77,718 14	$51,356 22	$1,469 95	$157,114 64

FISH CASES.

October-November-December, 1925.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Angling License Act	13	$290.00	10
Violations of Commercial Fishing License Act	1	25.00	---
Trout: over bag limit	6	125.00	---
Trout: offering for sale	1	100.00	---
Striped bass: over bag limit; undersized	13	245.00	60
Striped bass: sale, closed season	2	50.00	---
Crabs: undersized	13	200.00	---
Crabs: closed season	1	25.00	---
Clams: undersized; over bag limit	33	1,325.00	---
Cockles: undersized	2	50.00	---
Abalones: undersized; over bag limit	48	1,050.00	---
Lobsters: undersized	19	730.00	---
Lobsters: closed season	2	125.00	---
Salmon: taking, other than with hook and line	14	1,100.00	---
Salmon: over bag limit	1	100.00	---
Halibut: undersized	2	40.00	---
Barracuda: undersized	1	100.00	---
Fishing within 250 feet of fishways	4	25.00	540
Pollution of streams	3	200.00	90
Illegal night fishing	3	75.00	---
Nets: illegal possession or use	8	600.00	---
Totals	190	$6,580.00	700

GAME CASES.

October-November-December, 1925.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Hunting License Act	68	$1,115.00	10
Violations of Fur Trapping Regulations	4	60.00	---
Deer: hunting, killing, possession; closed season	35	2,760.00	150
Deer skins: evidence of sex removed	1	50.00	---
Deer: killing, possession; does, fawns, spike bucks	10	450.00	---
Ducks: killing, possession; closed season	1	50.00	---
Ducks: over bag limit	12	440.00	---
Wood ducks: killing, possession	1	25.00	---
Shorebirds: killing, possession	16	440.00	---
Wild pigeons: killing, possession	2	50.00	---
Doves: killing, possession; closed season	1	25.00	---
Cranes: sandhill, killing, possession	2	50.00	---
Quail: over bag limit	1	25.00	---
Quail: killing, possession; closed season	28	1,050.00	---
Pheasants: killing, possession	2	125.00	30
Nongame birds: killing, possession	12	300.00	---
Rabbits: cottontail-brush; killing, possession; closed season	10	230.00	---
Squirrels: killing, possession	3	95.00	---
Shooting from power boat, automobile	18	301.00	2
Night hunting	33	710.00	---
Totals	260	$8,351.00	192

SEIZURES OF FISH AND GAME.

July-August-September.

GAME		FISH	
Quail	2	Trout	246
Doves	71	Striped bass	579
Nongame birds	3	Barracuda, pounds	6500
Deer meat, pounds	1912	Pismo clams	4914
Rabbits	22	Crabs	19
Robins	6	Abalones	201
Plover	1	Salmon, pounds	12,350
Ducks	38	Crab meat, pounds	260
Sagehens	3	Smelt, pounds	10
Tree squirrels	3	Catfish	115
Bear hides	1	Lobsters	36
Bear meat, pounds	10	Nets	2

October-November-December.

Quail	95	Trout	167
Doves		Striped bass	276
Pheasant	3	Barracuda, pounds	2863
Nongame birds	9	Pismo clams	1073
Deer meat, pounds	944	Lobster	506
Rabbits	3	Crabs	781
Beaver hides	1	Crab meat, pounds	55½
Robins	2	Abalone	329
Ducks	1449	Salmon, pounds	1188
Tree squirrels	9	Nets	3
Shorebirds	268	Catfish, pounds	86
Seagulls	3	Spear	1
Deer hides	10	Halibut, pounds	1½
Bear hides	1	Cockles	22
Sandhill crane	1		
Mud hens	2		
Geese	139		
Wood ducks	2		
Pigeons	5		

CALIFORNIA FRESH FISHERY PRODUCTS FOR MONTHS OF OCTOBER, NOVEMBER AND DECEMBER, 1925.

By Fish and Game Commission
Department of Commercial Fisheries

Species of Fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Mexican, brought into California via San Pedro	Mexican, brought into California via San Diego
Albacore							1,093	51,514	327,225		200,469	1,595	7,310	589,206	247	9,128
Anchovies											3,415			3,415		
Barracuda										43,205	127,298		84,836	255,339	794,435	110,745
Bluefish								1,838	13,648					15,486		
Boccaccio							6,039	46,917	143,433					196,389		
Bonito									4,477	882	99,407	735	34,192	139,693	66,571	7,987
Carp		6,202		724	5,797	2,854								15,577		
Catfish		76,515		65	28,144	14,555								119,279		
Chilipepper							3	48,206	11 741					59,950		
Cultus Cod	520	13,306					138,231	10,222	98,194					260,773		
Dolphin																
Eels							5							5		
Flounders	1,219	35,400		53		1,403	218,345	7,667	159		159			264,405		
Grayfish							85,046				4,176		29,084	118,306		
Greenfish																
Hake							9,580							9,580		
Halibut	67						640	297	578	60,349	54,219	3,598	17,768	137,516	4,263	67,917
Hardhead		431			11,341	255								12,030		
Herring	1,503		1,920				50,648			361			9,065	63,497		
Kingfish							3,124	3,913	3,633		122,586		1,261	134,517		
Mackerel							30		177,675	9,316	501,475	48,296	155,236	892,028	266	7,331
Marlin																
Mullet													726	726		9,271
Perch	6,351	840	15,136				4,956	6,187	2,637	1,452	21,816	1,453	992	61,820	113	615
Pike				9	919	622								1,550		
Pompano											1,857			1,857		850
Rock Bass											12,583	6,091	18,319	36,993	3,378	10,580
Rockfish	3,469	9,438					229,156	22,973	83,632	5,449	441,246	9,723	424,846	1,229,932		680
Sablefish							54,093	40,729	2,217	3	247			97,289		
Salmon	320,885		7	2,263	4,241	4,774	37							332,207		
Sandabs		15,960					539,388	36,175	1,095	160	3,121	123		596,022		
Sardines			140				37,078		23,914,798		37,543,253	990	460,840	61,957,099		
Sculpin							125		153		16,227	10	7,545	24,060		
Sea Bass—Black										728	5,997	1,309	12,029	20,063	2,261	22,382
Sea Bass—White			2,797				5,169	16		26,215	5,403	1,934	27,247	68,781	82,370	24,372
Sea Trout													135	135		4,576
Shad				1,029	560	5,380								6,969		
Shad—Buck					24									24		
Shad—Roe																
Sheepshead																
Skates		650					47,126	925		47	10,732	10	12,115	22,904	70	313
											3,527			52,228		

Skipjack							1,341	8	3,492		1,784,652	3,598	13,703	1,806,797	2 143,074	1,126,511
Smelt	6,499	1,944	6,555				13,725	3,115	11,099	1,541	128,962	71,806	9,117	254,363		180
Sole		129,760					1.758,489	149,718	1,615	49,265	6,589	605	3.936	2,099,977		115
Splittail					580									580		
Striped Bass				28,054	65,791	204,480	923							299,248		
Stingaree																
Suckers		2,220			40											
Surf Fish														2,260		
Swordfish																
Tomcod			94				1,732	1,625			983		4,782	5,765		150
Trout—Farm														3,451		
Trout—Steelhead																
Tuna																
Tuna—Bluefin											7,608	580		8,188		
Tuna—Yellowfin															8,225	
Turbot			66				500				2,573.859		32.009	2,605,868	2,817 810	1,307,116
Whitebait			2,165				653							566		
Whitefish														2,818		
Yellowtail											57.806	16	17,654	75,476	42	227
Miscellaneous	45	1,144		201	50	10	2 871	140	7,146	476	33,434	96	217,052	251,058	98 979	143,599
										284	28,946	697		41,534	4,697	
Total fish	340,558	293,810	28,880	32,398	117,490	234,333	3,210,149	432,185	24,808,947	199,733	43,802,052	153,265	1,601,799	75,255,599	6,026,801	2,854,645
Crustaceans																
Crabs	[1]43,896	[2]4,656	[3]840				[4]527,376	[6]11,112	[7]2,832					[8]590,712		
Ecrevisse (doz.)																
Shrimps			258,159				74,468							332,627		
Spiny Lobsters										49 501	179,882	9,393	113,033	351,809	18,068	294,757
Mollusks																
Abalones									601,225	2,255				603,480	802	
Clams—Cockle		447	474											921		
Clams—Mixed	7,364													7 364	75	
Clams—Pismo										67.706				67,706		
Clams—Softshell			29,673			25,608	11,220							66,501		
Cuttlefish	32						1,788	7,215	14,089		55	15		23,194	55	
Limpets																
Mussels							7,708			231				7,939		
Oysters—Eastern							[5]194,040							[9]194,040		
Oysters—Native																
Snails																
Squid									246,826					246,826		
Miscellaneous																
Frogs (doz.)																
Terrapins (doz.)																
Turtles															21	
Totals	391,850	298,913	318,026	32,398	117,490	259,941	4,026,749	450.512	25,673.919	319,426	43,981,989	162,673	1,714 832	77,748,718	6,045.822	3,149,402

All amounts shown in pounds unless otherwise specified. Albacore and skipjack cleaned.

[1] 1829 dozen.
[2] 194 dozen.
[3] 35 dozen.
[4] 21,974 dozen.
[5] 882 000 shell oysters.
[6] 463 dozen.
[7] 118 dozen.
[8] 24,613 dozen
[9] 882,000 shell oysters.

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 12 SACRAMENTO, JULY, 1926 Number 3

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DEPLETION OF THE PISMO CLAM IN CALIFORNIA.

By William C. Herrington.

Contribution No. 57 from the State Fisheries Laboratory.

On certain sections of the California coast the Pismo clam beds support a fishery of considerable magnitude. During 1925, commercial diggers shipped more than 323,000 pounds of these clams from the Pismo-Oceano and Morro beaches. The fishery is, however, of much greater importance as a source of recreation and food supply to thousands of tourists and auto campers, as well to the local inhabitants of the region. During favorable low tides in the summer months of recent years, hundreds and sometimes thousands of automobiles were to be seen parked on the long sandy beaches at Pismo, Oceano, and

Morro, while their occupants were engaged in digging this esteemed mollusk. In former years the Pismo clam was found in abundance on most of the open sandy beaches of California from Santa Cruz southward. Due to unrestricted digging in the early years, the beaches were rapidly depleted, especially near the areas of densest population, until at present the clams are found, in any abundance, only on the Morro and Pismo-Oceano beaches in San Luis Obispo County.

An investigation of the life history and growth of the Pismo clam was begun by F. W. Weymouth in 1919. The results of his work were published in 1923 in Fish Bulletin No. 7 of the California Fish and Game Commission. Since 1923 members of the staff of the State Fisheries Laboratory have utilized the results obtained by Weymouth, in making an annual census of the clam population in the beaches of San Luis Obispo County. The purpose of the work has been to obtain material for a further study of the Pismo clam and to observe the effect of restrictions of size and bag limit in preserving its abundance.

The highly localized life of the clam in the intertidal zone of easily accessible beaches has provided an excellent opportunity for a quantitative study of the effects of dominant year classes, successful spawning seasons, and overfishing, on the abundance of a species. Any information on such questions is of value because of its possible application to the life history study of less accessible animals.

This article is written to bring to the attention of those interested in the future abundance of the clams, a brief description of the depletion in the fishery which has occurred since the first census of the beaches was made in 1919. A more detailed explanation of methods, data, and calculations will be published at a later date.

Oceano beach has, in recent years, furnished the greatest abundance of Pismo clams on the California coast, and is also the only beach for which we have complete records from 1919 to the present. For the foregoing reasons it has been selected as the location of the present investigation. Work done on the other beaches during the last three years bears out, in all the essentials, the results obtained at Oceano.

In order to study the fluctuations in the abundance of the clams, several cross-sections of the beach were made each year. The sections were of a standard width and made at the same location on succeeding years. All of the clams were taken from the sections, then counted, measured, and their ages read. Comparison of the data obtained from corresponding sections on subsequent years shows the fluctuations in the abundance and size of the clams in such a section. As these sections were made at representative locations on the beach, their fluctuations in abundance give a measure of the fluctuations in the population of the entire beach.

Tables 1 and 2 give the results obtained from the cross-sections made at Oceano during the years 1919–1925. Table 1 gives the total number of clams taken from the cross-section each year and the year classes from which they came. Table 2 gives the same data, but with the number of each year class reduced to per cent of the total number of clams from the section for the respective years. Examination of the table shows that the greater part of the clam population from 1919–1924 was formed by the 1919 class. This is graphically shown in figure 23. The solid line represents the number of clams of all ages taken

from the Oceano section for each year since 1919. The dotted line shows the number of clams of the 1919 class taken each year from the section. If the area beneath the solid line is considered as a representative sample of the entire beach population for the years represented, then the area beneath the dotted line gives the proportion the 1919 class formed of the total and the cross hatched area gives the proportion of all other classes. This graph shows to what extent the 1919 class has dominated the clam population in the beach since 1919, and how the destruction of this class must necessarily cause a great depletion of the total population.

TABLE 1.

Number of Pismo clams of each year class obtained from the Oceano cross-sections since 1918. The sections were 16cm. wide.

Date	Before 1918	1918	1919	1920	1921	1922	1923	1924	1925	Total
September 11, 1919	0	16±	704±							720
November 23, 1920	0	4	490	1						495
July 23, 1921	0	42	418	2	0					462
August 25, 1922	0	31	465	13	12	3				524
October 24, 1923	2	11	317	20	6	29	1			386
November 25, 1924	0	6	169	5	11	31	7	65		294
October 30, 1925	0	0	5	1	2	4	3	54	5	74

TABLE 2.

The figures from Table 1 in percentages.

Date	Before 1918	1918	1919	1920	1921	1922	1923	1924	1925	Total
September 11, 1919	0	2	98							100
November 23, 1920	0	1	99	0						100
July 23, 1921	0	9	91	0	0					100
August 25, 1922	0	6	89	2	2	1				100
October 24, 1923	1	3	82	5	2	7	0			100
November 25, 1924	0	2	58	2	4	10	2	22		100
October 30, 1925	0	0	7	2	3	5	4	72	7	100

The dotted line in figure 23, showing the decreasing number of clams of the 1919 year class in succeeding years, forms the mortality curve of the class. The heavy mortality between 1919 and 1920 occurred during the first year of the young clam existence, when they were small and more or less at the mercy of their natural enemies. For the next two years the mortality was very slight. During this time the clams were large enough to be safe from their natural enemies, and yet too small to be dug by man. From 1922 through 1925, the clams of the class were reaching the minimum legal size limit of $4\frac{3}{4}$ inches. Because of the scarcity of larger and older clams, the members of this new class were dug in great numbers by the clammers. The effect of this extensive digging is shown in the curve from 1923 to 1925. About one-third of the total number were taken each year until at the end of 1925, the entire class had been nearly wiped out.

The depletion of the 1919 class, and consequently of the entire fishery, is shown in another manner in figure 24. This graph shows the length frequency curves for the clams from the Oceano cross-sections at the end of 1924 and 1925. In the 1924 curve, the first peak near the

2 cm. length represents the class spawned in 1924, the next two peaks are for the 1923 and 1922 classes, and the great peak about the 11½ cm. length is due largely to the 1919 class, which makes up 58 per cent of the total population and dominates the year groups of 1921 and 1920, as well as all the older groups. The cross-hatched area shows the proportion of clams which were above legal size. The 1925 curve represents the population one year later. The most important change during the year is in the 1919 year class. The members of this group have practically all passed the minimum size limit and due to the heavy fishing, few of them have escaped the diggers. The other year classes have moved along as expected, and as they are below the legal limit, they have suffered little depletion. This is, indeed, a strik-

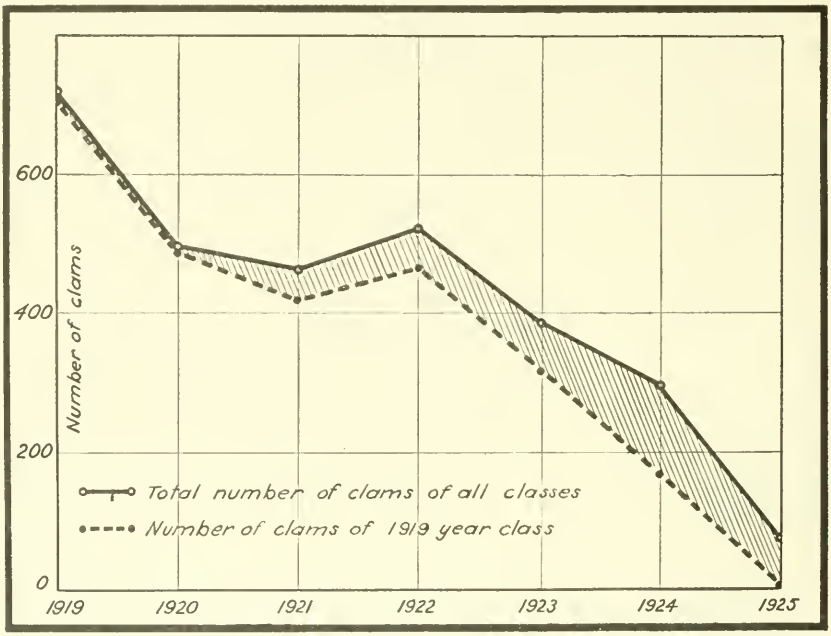

FIG. 23. Graph showing the influence of the dominant year class of 1919 on the abundance of clams at Oceano Beach. The solid line shows the total number of clams taken from the Oceano cross-section each year since 1919. The dashed line shows the number of these which were of the 1919 year class. The values are from Table 1.

ing commentary on the imminent fate of the clams once they have passed the size of legal protection.

The growth of the numerous 1919 class to legal size during 1923, 1924, and 1925, caused a great increase in the available supply of clams in the beach. This increase in the abundance of large clams caused a general belief, among many people interested in the fishery, that the Pismo clam was coming back to the abundance it enjoyed in former years. A glance at figure 24 shows how fallacious is such a belief, for the recent abundance is but a temporary condition caused by the growth of one numerous year class. Due to the heavy fishing, the clams of this class were practically wiped out in three years. Enough of the clams were left at the end of 1925 to furnish a moderate supply

to the few diggers during the winter of 1925–1926, but when the heavy summer fishing is again imposed in 1926, the full effect of the great depletion will be felt.

Now that the supply of large clams is, for the present, nearly exhausted, the question is, What can we expect of the future supply? Any future supply of clams must come directly or indirectly from the younger year classes now in the beach. A knowledge of such classes is, therefore, essential to any intelligent program for the future. The only class now found in any abundance at Pismo or Oceano is that of

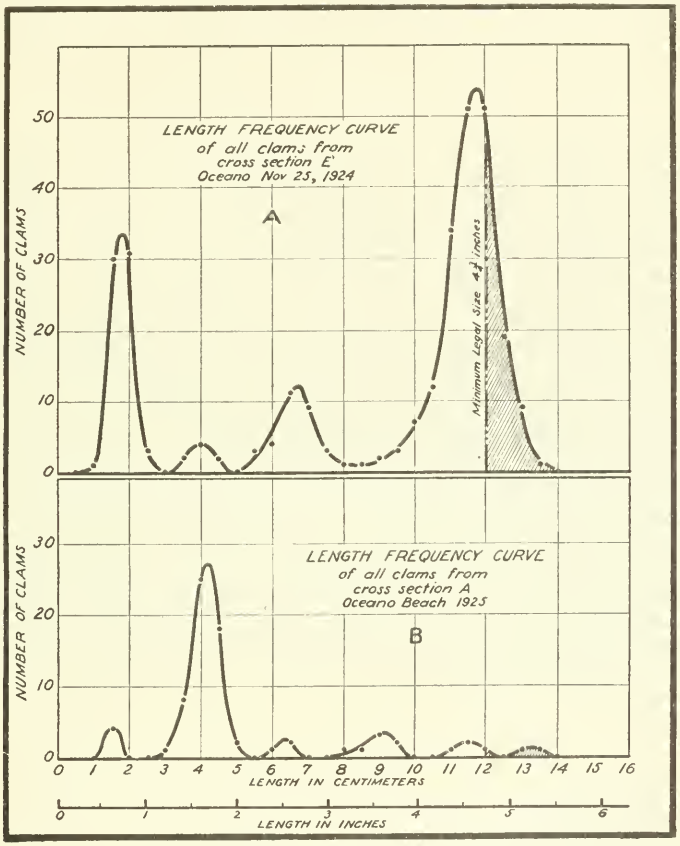

FIG. 24. Length frequency curves for cross-sections at Oceano in 1924 and 1925. In curve A, for 1924, the mode about the 1.8 cm. length represents the 1924 year class. The great mode about the 11.8 cm. length is largely due to the 1919 year class which dominates the year groups of 1921, 1920 and 1918. The shaded area shows the proportion of the clams which have reached legal size. Curve B is for a cross-section made one year later at the same location as A.

1924. This class, although the most abundant since 1919, is but 11 per cent as numerous as was that class at the same age. It can, therefore, be expected under present conditions to have a correspondingly small influence on the future supply. Indeed, the increasing scarcity of the large clams will make the small ones more and more the victims of

thoughtless and unprincipled diggers, and if they are not rigidly protected, it may well be that few of them will ever reach legal size, or mature sufficiently to spawn and thus help perpetuate their race.

If any intelligent program for the preservation of the Pismo clam fishery is to be carried out in the future, it is essential that there be an understanding of the agencies that have caused the present depletion. The data collected since 1919 gives a general idea of the enormous number of clams removed by these agencies. Our cross sections show that at Oceano in the fall of 1922, there were approximately 5,270,000 Pismo clams in a single mile of beach. When it is considered that the productive area of the Pismo-Oceano Beach is from seven to nine miles in length, it is evident that even if the foregoing estimate is high, the total number of clams must have been enormous. Three years later in the fall of 1925, similar sections show that the number of clams had been reduced to 750,000 individuals for a mile of beach; a reduction in three years of 4,520,000 clams, or 86 per cent. The cross-sections were made near the middle of the productive area and can be considered as representative of, at least, the central section of the beach. During the three years for which the data is cited, there occurred no great natural catastrophe which could account for such a mortality. There have been reports now and then of the destruction of clams by the presence of oil from tankers loading at Port San Luis. In the cases reported the destruction has been comparatively slight, and in no case would it begin to account for the observed depletion of the clam beds.

The only agency, of which we have knowledge, that could have produced the great depletion which has taken place, is man, as represented by clam diggers of all kinds. These diggers can be divided into two groups, the commercial and the amateur. Commercial diggers ship practically their entire catch to outside markets and are required to possess a state license. Because of these two checks on their activities, they are comparatively easy to watch and control. On the other hand the amateur digs clams for use or for the fun he derives from the performance, and either uses his catch himself or gives it to friends. There is no record of the extent of his activities, and any calculations as to their effect on the fishery can be considered as but rough estimates.

The records of the Fish and Game Commission show that the total weight of the commercial catch from the entire Pismo-Oceano beach during the three years, 1923–1925 was slightly under 575,000 pounds. This represents a total of somewhat less than 550,000 individual clams. Our cross-sections show that at Oceano a single mile of beach suffered a depletion of 4,520,000 clams during this same period. It, therefore, seems quite evident that the commercial diggers can have been but a minor factor in the depletion of the beach.

The part played by the amateur diggers in the depletion of the Pismo clam fishery is difficult to analyze because of the lack of any statistics on the amateur catch. In order to obtain any conception of this phase of the fishery, we must fall back on the observations of dependable eyewitnesses. At any low tide during the summer of 1925, several hundred machines were parked along the hard, smooth Pismo-Oceano beach, while their occupants were busily engaged in obtaining their limit of clams. On week-ends and holidays this number was increased many times. Mr. Edwards, the fish and game deputy at

Oceano during the summer of 1925, stated that on several occasions during that time he had counted and estimated about 1500 machines parked on the beach, while their drivers and passengers were digging clams. His figures are for the number of machines present at the time his count was made, and do not take into account the diggers who must have been on the beach at other hours during the day or at the low night tides. These estimates were corroborated by residents near the beach and by our own observations. It is impossible to obtain any accurate record of the number of clams taken by such a group, but a general idea of the amount can be arrived at by some rough estimates. If we make the conservative assumption that each machine carried two diggers, then at a time such as observed by Mr. Edwards there would be 3000 diggers on the beach from the automobiles alone. As the clams were

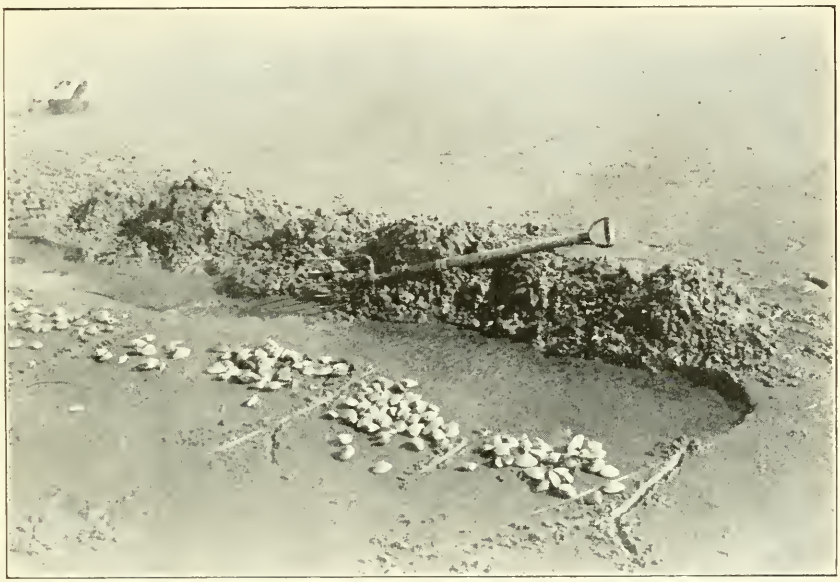

FIG. 25. Pismo clams from Watsonville Beach. The numbers of clammers along beaches where this large clam is to be found has increased to such an extent that the future of this shellfish is threatened.

located well up on the beach at low tide and were very numerous, especially during the early summer, the limit of fifteen clams was easily obtained even by the most inexperienced. Assuming that each digger obtained his limit, the three thousand autoists would obtain a total of 45,000 clams.

Considering the number of times such a group was present during the summer and the number of clams dug by smaller parties during the week, it can readily be seen that the catch secured by autoists, campers, and local diggers might account for the great decrease in the number of clams in the beach since 1922. The great volume of automobile traffic along the coast highway would probably account for a large part of the depletion, as Pismo and Oceano are favorite stop-over points for tourists and campers. These estimates are for the Pismo-Oceano beach only. Morro beach lies off the main traveled road and,

due to its remote location and to the greater abundance of clams at Pismo and Oceano, has been less frequented by both commercial and amateur diggers.

The condition which has made the 1919 class so readily susceptible to the inroads of the unskilled diggers, was the location of the clams well up the beach in the intertidal zone. There appears to have been very little diffusion of the individuals of this class into deeper water where they would have been less readily accessible. A number of trials made at low tide in water from two to five feet deep indicated that the clams at this depth were less abundant late in 1925 than at any time since records have been kept. This condition makes the stripping of the intertidal zone even more alarming as the reserve stock of clams in deep water is small and will have a correspondingly small influence in maintaining the fishery.

This brief survey of the present condition of the Pismo clam beaches in San Luis Obispo County indicates that they are at a very critical stage. Unless drastic measures are taken in the very near future, these beaches will soon be reduced to the same condition that is now found at Long Beach, Anaheim Beach, and other southern California beaches, where this clam was formerly abundant. In considering protective measures, it must be remembered that at present the number of diggers is so great in comparison to the supply of clams left in the beach, that reduction of the bag limit would serve merely to slightly retard the disappearance of the clams. Measures must be devised which will protect the present young year classes until there has been an opportunity for a new breeding stock to be built up. The alternative is the loss of a valuable natural resource, and the waste of the productive possibilities of many acres of beach.

SUGGESTED DATES OF OPEN SEASON ON DEER IN CALIFORNIA.

By James Moffitt.

The recommendation recently made by the San Joaquin County Game and Fish Protective Association that the laws be changed to provide a uniform opening date, September 1, for the deer season has prompted the writer to set forth the following opinions based on personal experience. Newspaper publicity given the above mentioned resolution indicates that it results from the belief that antlers are in the velvet prior to September 1.

I believe that our present game laws as regards deer hunting are the most sensible of any and very nearly perfect. It seems unfortunate that they should be criticized in what I believe the wrong direction. However, suggestions for change are usually made with the sincerest intentions for the benefit of our deer; and after all the only way we can effect improvement is by recommending changes.

I have hunted for the past five or six years in Sonoma and Mendocino counties, and for at least five years prior to that have made observations on deer in Marin and Sonoma counties and I believe that I am well acquainted with conditions in this section. The deer start shedding the velvet in July, usually about the 15th, and once begun the

process is a speedy one. I have never seen a buck in the velvet after August 1. A five-pointer that I killed near Glen Ellen in Sonoma Valley on this date had a few shreds of dry skin adhering to the base of his antlers. The latest date on which I have seen a buck in complete velvet in this section is July 25. While a few backward individuals may retain the velvet a short time after the first of August, I am certain that by far the greater proportion lose it before this date. Reports from hunters in the region south of San Francisco Bay, Mount Hamilton and Livermore sections, indicate that this also holds good there. Therefore, it will be seen that there is little danger of bucks being in the velvet on the opening of the season, August 1 in this section, whatever the objections to this may be.

The closing date in this region is now September 14. Permitting shooting after this date would be absolutely wrong as the coast deer

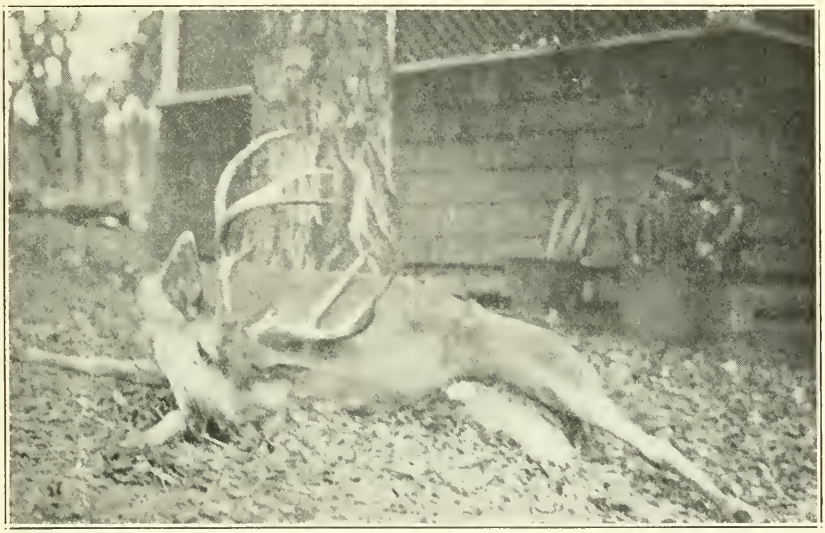

FIG. 26. Columbian black-tailed deer killed near Glen Ellen, Sonoma County, California, by the author, August 1, 1921. Note hard, fully matured condition of antlers entirely free of velvet. Photograph by James Moffitt.

start "running" very early. In Mendocino County, about twenty-five miles northwest of Cloverdale on the headwaters of the Garcia River, where I have done considerable hunting, the bucks' necks start swelling about September 1, and by September 15 are considerably enlarged, showing that the rutting season is at hand. Due to their greater activity at this time and also to the fact that they forsake the brush for the wooded sections for the acorns which fall at that time, much better hunting is afforded during the last two weeks of the season than during the previous four. It would be against all principles to hunt after this time when bucks are running with does, and any change in the season in this section should be towards an earlier closing date, if necessary. However, the present open season seems about ideal, as deer appear to be increasing yearly and there is no apparent need for any change or reduction in bag limit.

In the Sierras in the Tahoe region and in Alpine County, where I have also hunted deer for the past twelve years, they appear to be about six weeks behind those above mentioned. I have never seen a deer out of the velvet, or even commencing to shed it on September 1, and I believe that September 15 is about the average date when shedding is completed. If there is objection to hunting them when in the velvet, the season should not open until September 15, that is, two weeks later than at present. This, I believe, would be a good plan, not for the reason that antlers are still in the velvet, but because it would save many deer from other than the more enthusiastic hunters. Most of the summer vacationists who incidentally go deer hunting are out of the mountains by mid-September, while regular hunters could go out after this date just as well, when they would find the mountains more attractive through the absence of a crowd of novices. Also two holidays,

FIG. 27. Rocky Mountain mule deer killed near Lake Tahoe, Placer County, California, by H. C. Moffitt, September 1, 1921. Note that the horns are in complete velvet, round pointed, and far from the mature condition. Photograph by E. G. Schmiedell.

Labor and Admission days, would be avoided, with their attendant tribe of nimrods.

Up to five or six years ago I noticed a marked increase in the number of deer in the Sierras, and since that time they seem to be holding their own in numbers. (This probably is because of the wise extermination of mountain lions, and the establishment of game refuges for the preservation of a breeding stock.) As hunting increases, as it is bound to do, it may become necessary to impose further restrictions here. In my mind the first move should be to shorten the season to four weeks, commencing two weeks later than it does now and closing as at present on October 15. This, as above indicated, should effect

a considerable saving. Under no circumstances should the season be prolonged after mid-October, for in the first place there are rarely any deer in the higher mountains on that date, as they suddenly migrate west at the first snowstorm, usually about October 10, and secondly because some are about to start "running" by this date, although the majority probably does not do so until nearly a month later. If further restrictions are necessary, the bag limit should be reduced to one buck per season. In the case of large animals, such as are found in the Sierras, this should be sufficient for anyone.

The shortening of the season to four weeks and the protection of forked-horns in Modoc County as enacted at the last legislature, was an excellent move. Rather than working a hardship on hunters in this section, it is actually a blessing, as it is here that hunters go for big heads. By protecting forked-horns there will be more large deer available, for after the first season, it is evident there will be just as many deer of legal age to kill, less the small percentage that die of natural causes during their third year, as in previous years. It is to be regretted that the law was not also applied to Siskiyou or at least to the eastern portion of that county, as mule deer range there as abundantly as in Modoc County. Last season, many hunters secured forked-horns there the first two weeks of September. It is possible that the "no forked-horn" law could be applied with advantage to all the Sierra Nevada country, where deer do not attain full size until the fourth or fifth year. It is excellent legislation both from the conservation standpoint and the extra caution it imposes on the hunter. Needless to say, it will not work in the coast counties, as here most old bucks revert to forked-horns (known as "Pacific" bucks), and bucks with more than two points on a side are scarce.

The present season in Game District 1½, comprising Humboldt, Del Norte and Siskiyou counties, with the exception of the change suggested above for the latter county, seems to be about the right thing, since the deer here are later in shedding the velvet, running, etc., than in the counties to the south. These functions probably occur here at about the same time as in the Sierras, therefore the two areas may be considered together as regards opening and closing dates. Due to the type of country and number of hunters, however, there does not seem to be the danger of diminishment here that may exist in sections of the Sierras.

As I have had no experience in Districts 4, 4½, or 4¾, comprising the southeastern portion of the state, or in Monterey, San Luis Obispo, Santa Barbara, or Ventura counties, the southern portion of District 3, I am not in a position to discuss the status of the deer there.

In conclusion it may be inferred that I believe the game laws, as applied to deer in California at the present time, pretty thoroughly cover the situation, and that sufficient evidence to necessitate any drastic changes at present does not seem to exist, except possibly in Siskiyou County as already indicated.

A marking system, the use of tags, such as has been advocated, is a good thing and one which we should all work for. Let us hope that some action to secure the same will be taken at the next legislature.

FISH AND GAME COMMISSION ADOPTS NEW POLICY OF FISH PLANTING.

By B. D. Marx Greene.

A recent survey of the apportionment of trout for distribution throughout the state revealed the inadequacy of the present system. Thus it appears that the highly competent and efficient work of Mr. Shebley and his staff is dissipated by the subsequent unsatisfactory handling of the fish.

After the trout leave the fish cars, the responsibility of Mr. Shebley, superintendent Department of Fisheulture, really ceases and much of the commission's efforts and money spent in propagation of trout is virtually wasted through an inefficient and unpardonable method of distribution. This is not Mr. Shebley's fault. He is in no wise to blame. It is the fault of the commission.

The whole trout planting system is based upon applications from individuals and organizations, requesting fish, and in most cases designating only generally where they are to be planted. The commission has depended entirely on outsiders to choose localities to be planted and to do the planting.

To a certain extent the sportsmen have a just cause of complaint, but yet again they, themselves, are to blame, for it is their incessant and unceasing demands for fish and more fish and the political and other pressure which they have brought upon our commission that has led to the present conditions.

Recently the writer checked over some 500 applications for fish. The reason for so doing was that Mr. Shebley did not wish, alone, to take the responsibility of not shipping Loch Leven and brown trout to regions which have received them in the past but which, in accordance with our new policy, are not to receive them in the future. In other words, many waters which are strictly rainbow waters have in the past been stocked with Loch Leven and brown trout, and Mr. Shebley did not wish, personally, to take the responsibility of cutting down the requested allotments. Time and time again, in checking over individual applications, instances were found where last year brown and Loch Leven trout were sent to an applicant, who this year will be furnished with rainbow or brook trout only. In some instances, Mr. Shebley had penciled a note on the application to the effect that the lower waters of the region proposed to be stocked were adaptable to Loch Leven and brown trout, leaving it to me to say whether or not they should be sent this year. My question to Mr. Shebley would, in each instance, be "Can we rely upon the applicant to put the brown and Loch Leven in the lower reaches and the rainbow in the upper reaches?" and, in practically every instance, he would reply that there could be no guarantee of such planting, and that we would run the risk of having Loch Leven and brown trout again planted in rainbow waters. Consequently, I have been ruthless in cutting the applications, and from one end of this state to the other there is going to be a clamor from malcontents who do not receive the amount and kind of fry they requested.

Furthermore, many of these people are not only willing, but actually request, that they be given Loch Leven and brown trout, whereas, to

be consistent, we must restrict these varieties to the levels below the 3500-foot contour, or to localities where they can not pass into rainbow streams.

In checking over the applications one finds that the applicants seem to feel that they have a "God-given" right to a certain quota of fish. In most instances they only generalize as to what streams they will plant. In other words, they feel that they have a property right in a certain amount of trout fry, and that they can plant them when and where they choose.

Our entire planting system is fundamentally and entirely erroneous. It is as much the commission's duty to see that proper plants are made as it is to rear healthy fry. Surely, if our new game farm were to hand out pheasants and quail to any person who asked for them and were to let them plant the birds when and where they wished, it would be a failure. It is our duty to see that proper localities are selected, which will harbor and protect the birds and yield the best results. This year, every pheasant delivered from the game farm will be planted by our own men, and we will take the full responsibility for the planting. This should have been the case with our trout planting.

From personal contact with our deputies and sportsmen's organizations throughout the state it is apparent that only too often the following conditions occur during the planting season:

For many months an organization of enthusiastic sportsmen will meet frequently to discuss planting problems for their streams; they make up their minds as to what streams shall be planted and the number of fry necessary, and then file their application with the Sacramento office of the Fish and Game Commission. This application is fully considered along with hundreds of others and an allotment is made, often, of necessity, in quantities less than requested. Advance notice of the arrival of the fish car is given to the applicant—and then all of the carefully arranged plans seem to miscarry. The men who had signified their willingness to be on hand to receive the fish and care for them are detained by urgent personal matters—the truck that had been promised fails to arrive—a haphazard, untrained crew meets the fish car, and, becoming weary of their labors after going a portion of the distance, they dump the fish into the first available stream. No equalization of water temperature is attempted; proper aerating of the water is neglected, and the fish are often dead or dying long before they reach their proper destination. This, I am reliably informed, is not an exaggerated picture.

Furthermore, each of the parties planting fish is required to make a report to the Fish and Game Commission specifying what fish are planted and where, and the condition of the plant. These reports are, in many instances, not furnished; or, if furnished, are not accurate.

Any accident to the fish is blamed upon the commission which, unfortunately, has no possible method of checking up to find where the blame should properly be placed.

This criticism is, perhaps, a little too general. There are many individuals, and some organizations, that cooperate with us fully in planting, notably the Fresno organization under the leadership of Mr. Grimes. Their planting can not be bettered, but these men and organizations are in the minority.

Hereafter the commission will receive no applications for trout fry. It will immediately proceed to make a thorough, state-wide investigation and survey to determine what species of fish are now in our streams and lakes, their approximate abundance, and the species that should be planted in the future. Prior to the opening of the next planting season, a decision will be made as to the streams and lakes that will be planted—the proper number of fry will be allocated to each and then, in each county or locality, certain individuals will be selected who can cooperate with our local patrol to insure that the fry intended for a certain stream or lake are actually planted therein.

Furthermore, adequate resting stations with troughs are to be established throughout the state in suitable locations, and the fish left there until adequate and proper transportation can be arranged. All planting must be done under the supervision of commission employees who will be trained in the work, and thoroughly coached by Mr. Shebley prior to the time their new duties begin.

Arrangements are now being made for a large map, to be placed in Mr. Shebley's office, and used as a key to all of our streams and lakes, so that we may visualize our planting problems. This map, by appropriate colorings based on the survey now under way, will show the needs of future plantings.

A BIRD HOUSE COLONY.

By Grace M. French.

The appearance some years ago of a pair of bluebirds in our yard at Carlton, Oregon, prompted us to put up a bird house for them. It was a fearful and wonderful structure viewed in the light of later experience and knowledge of the birds; it was made from a small box a foot long and ten inches high. Two doors were cut on opposite sides at the level of the floor. The roof was gabled, and the house then painted a bright red color.

The male bluebird of this pair was immediately attracted to the house, but the female would have nothing to do with it, and chose to nest in another house that was nailed to the trunk of an oak tree. There she raised three broods, fifteen in all, that summer. The male bluebird took the two first fledged broods to sleep in the red house each night and in that way kept other birds from nesting therein. That fall (1915) we had a band of seventeen bluebirds in the yard, and for the last few years bluebirds have occupied six of the houses. They are by far the most quarrelsome of any bird nesting in the yard. During the first two weeks of February there is a constant state of excitement among them and by Valentine's day they are mated and looking over the houses. As they stay here all winter they have the first choice and the swallows and wrens have to take what is left. There are, however, over fifty bird houses on the two acres near our home and birds invariably find nesting sites to their taste.

The birds become so accustomed to persons moving about the yard that they pay little or no attention to them. For example, I once stood within ten feet of a northern violet-green swallow that was disputing a piece of nesting material with a bluebird. Curiosity seems to be one of the leading traits of the bluebird, for they are constantly

peeking into the doors of the other bird houses. I have never known the bluebirds to kill any bird or destroy a nest, but they keep the other tenants of the bird houses continually on the defensive during the nesting season.

During very cold winter weather the bluebirds leave the yard and resort to the fir woods, where one hears them calling from the tops of the tall trees. Here I have watched them foraging on the bark of trees for insects. As soon as the weather moderates they come back to the hill on which our home is built.

Sometimes, in winter, as many as a dozen bluebirds will sleep under the same roof, but they do not necessarily choose the same house each night. Unlike the bluebird, in this respect, the slender-billed nuthatch will go to the same house every night for months, unless, perchance, the bluebirds appropriate it, but if the nuthatch can once get inside, he can fend off any number of bluebirds. Despite this seeming regularity, these nuthatches are whimsical, for they will frequently desert a site that has been their home for two or more seasons.

The Oregon chickadee prefers more natural nesting sites, so we sawed out sections of hollow limbs and put them up in suitable places. Since then we have had one and sometimes several pairs of these attractive and useful birds living in the orchard. The chickadees also sleep in the houses in winter.

A male Gairdner woodpecker has appeared in the yard every evening for many months. He gives his call, then ducks into his chosen house, part of a hollow limb of an old apple tree set on top of the clothes line pole.

We have six larger houses which have been occupied by flickers. Occasionally a pair of sparrow hawks will leave the woods and raise their young in one of these houses. The Lewis woodpeckers have never nested in the bird houses, but nearly every winter one or more of them come to the yard to feed on the bountiful supply of acorns to be found on the large oak trees on the hill, and to sleep in the houses.

The red squirrels store acorns in the bird houses and often make their nests there in winter. In search for these stores of acorns the stellar jays go from house to house and pull out the old nests, thus cleaning them for the birds. Once, when I wanted to show the right type of bird house to a group of school children, I took down a house that had been nailed on a large oak tree and found that it not only had a nest in it, but that the squirrel was at home. He had stuffed the door full of moss, and he set up a noisy chatter at the unexpected house moving.

If a pair of swallows seem disturbed at something near their old home it is wise to take the house down to investigate, for wasps occasionally make their paper nests in a bird house or a noisy bumblebee may use one of these cozy places to set up housekeeping.

In some localities the house wren seems to have gained a bad reputation, but I have nothing but good to tell of him. In my large colony of bird houses, these wrens have attended strictly to their own affairs. As many as six house wrens have nested on the acre near the house, and watching from the window, I have never yet observed them to interfere with the other birds; nor do the swallows or bluebirds bother the wrens or show any concern when they nest near them, despite the fact that some of the houses are not more than ten feet apart. The

house wrens take all sorts of nooks and any size of house for a nest. One pair used a large barrel, that had previously served a flicker, and another a pasteboard box that had held feed in the weather vane feeding station. Though I have found house wren nests in all sorts of places, they are usually to be found in sunny or exposed sites. For instance, one nest was behind a piece of loose bark on a large oak tree far out in the pasture. However, one associates the house wren with the dwellings of man and that is where one most often finds them.

The Seattle wren is more retiring in its habits, and its nest is generally found in among the trees in shady places. Catering to this preference we made ten wren houses out of three-pound tin cans, with inset covers. With a can opener I cut a hole in the center of the cover, and drove a nail through the back of the can into a small board. We then put these houses up on the trunks of trees along the hedgerow, and down in the pasture. Every house was subsequently occupied and all went well for a few seasons until one day a group of small boys tore down all these improvised houses. Fortunately there were no small birds in the nests at the time. Since then all bird houses have been put in the yard where I could protect them. When the cans were occupied, it was a simple matter to remove the cover and examine the nests without disturbing the birds to any extent. These tin can houses were satisfactory, for they were put up in very shady places, but whenever possible, it is better to use wooden structures. I have often found these Seattle wrens nesting in empty cans that have been left in the barn, between sticks of wood piled in the pasture, in holes in the ash trees down in the swale, or in piles of brush on the hillside near the fir woods. While this bird does use a bird house, it is not essentially a door-yard bird as is the house wren. It is most often found near the woods.

While the birds I have mentioned are all attractive in their different ways it is the swallows that are the distinctive feature of my colony of house nesting birds. One of the most devoted, attractive and by far the noisiest bird around a bird house is the male tree swallow. He talks to his mate and peeks in the door to see her many times through every hour of the day. He begins his chatter at the first sign of dawn and with four and sometimes more of these birds nesting near the house the yard is a noisy place on summer mornings. We have never banded any of the birds but who could doubt that it was one of our old birds that had returned when one March first on hearing the familiar chatter I saw a tree swallow high in the air, then thrilled to see that this first migrant was headed straight for the yard and then—best of all—it flew directly to the very house that a pair of tree swallows had occupied the previous summer.

It is fortunate for us that our farm is off the main highway, for otherwise we would be bothered by many curious people who would be attracted by the numerous bird houses and the swarms of birds circling over head. In the yard there is a high aerial, 120 feet long, of four wires, swung between two masts, one of which is 101 feet high and the other 60 feet. These long, high wires and the guy wires furnish resting places for the swallows, and they are often weighted down with the young tree, violet-green and cliff swallows that nest on the barn. Some seasons there are as many as twenty pairs of violet-green swallows nesting on the two acres near the house. They are not at all particular

as to the site or size of the house for their nest. They even use the tin can wren houses or little nooks around the buildings, or nest under shingles, or other sheltered places. They seem to want the company of others of their species. The swallows are attractive for their beauty and they are a great economic asset on a farm in controlling the flies and other insects.

The house that we have adopted as being both practical and good looking is of one compartment, ten by eight inches, with gable roof eight inches to the peak, with the entrance, one and one-half inches in diameter, near the top. The ends are made of inch lumber and the rest of the house of one-quarter inch lumber. Most of the houses are nailed to boards and these boards nailed to fence posts, thus raising the bird houses about eight feet from the ground. The cats never bother a house put up in this way.

An Englishman, who claimed that the English sparrow is a beneficial bird and wanted to see the ban lifted from this foreign invader, wrote to me and asked if I had not observed these birds eating aphides on rose bushes. I could verify this all right, but wrote him that we immediately shot every English sparrow that appeared in the yard, for I have studied their behavior on the neighboring farms. One old orchard, that once boasted a large colony of native birds, now has nothing but these sparrows, for they were permitted to usurp all the nesting places. It has never been necessary to shoot more than two or three English sparrows any year, for every bird in the yard bands together to fight them if they dare to try and enter any of the numerous houses.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

September 1, 1926.

"The nation, and indeed the world, have need for a thorough appraisal and understanding of natural resources, both in wild life and in the riches of the earth." —Calvin Coolidge.

AN IMPORTANT COURT DECISION.

On May 17 the District Court of Appeal, First Appellate District of San Francisco, decided in favor of the Fish and Game Commission an original writ of *habeas corpus* brought by one James A. Makings in an attempt to declare unconstitutional that portion of the Penal Code which prohibits the exportation of crabs from Humboldt County. The matter was argued freely and in the opinion delivered by the appellate court this section of the law was declared constitutional and the court handed down the general doctrine that the legislature has the right to enact special legislation for individual fish and game districts. This is a most important decision outlining the way for future legislation.

N. B. SCOFIELD ATTENDS MEETING OF INTERNATIONAL FISHERIES COMMISSION.

On June 21, 22, 23, N. B. Scofield attended the first formal meeting of the International Fisheries Commission—United States and Mexico. The meeting was held in Los Angeles and the four members were present. It was decided to secure offices for the commission headquarters at San Pedro, and the Mexican and American members each chose a secretary to carry on the detail work of the commission at these offices. Miss Geraldine Conner, secretary of the Department of Commercial Fisheries, California Fish and Game Commission, was chosen as secretary by the American members.

The Fisheries treaty provides that fishing boats operating off the coast of California or the coast of Lower California must conform to the laws of the countries adjoining these waters, and also to the regulations which might subsequently be adopted. From every ton of fish caught by American boats in Mexican waters, the Mexican government now derives a $30 fish tax. At the request of the American members, the commission has recommended that the Mexican government reduce this tax from $30 to $20 per ton, and there is every assurance that this will be done by the end of August.

The treaty further provides that correct data on the "catch" of American boats in Mexican waters be furnished the California authorities. This is essential for conservation purposes.

The canners, fish dealers and fishermen of southern California will welcome a commission of this kind, for it offers an adequate channel for dealings with the Mexican government.

The United States government has appropriated $30,000 for the work of the commission for the 1926–1927 fiscal year, while the Mexican government has made an appropriation of 158,000 pesos. Under the terms of the treaty, this money will be largely used to facilitate the conservation work of the respective fishing authorities.

The commission recognizes the value of the fisheries program being carried on by the California Fish and Game Commission, and desires to cooperate with it and gain its full support. It also desires that its research workers use, as far as is practicable, the State Laboratory as their headquarters. This cooperation will extend the work of the California Commission to species in immediate need of investigation, which have thus far been neglected owing to lack of funds. Among those are: spiny lobster, barracuda, sea bass, and California halibut.

GRUNION NEEDS PROTECTION.

Those who have read the two fish bulletins which deal with the life history of the grunion or "little smelt" will need no additional stimulus to stir their interest in this remarkable small food fish of the southern California coast. Thousands of residents in southern counties know of this small fish that is found on the beaches in the wash of the waves during the periods just after the full of the moon and the dark of the moon in the

spring, and many make monthly pilgrimages to the beaches to collect the fish for food. Whether additional publicity given this interesting fish, due to the discovery of its extraordinary spawning habits, has increased the number of persons visiting the beaches, we do not know. However, those who have been making a study of the fish find either it or its eggs increasingly difficult to secure during the regular spawning seasons. This has been particularly noticeable this spring and conservationists are becoming worried as to the future of the grunion. One of the fundamental laws of conservation is that breeding animals shall be left undisturbed. The fact that people gather by the thousands at Long Beach and other beaches and collect the small spawning grunion as they run onto the beach to lay their eggs means that the breeding grounds are being continuously raided. Evidence is at hand that depletion is taking place and that protection during part of the spawning period is necessary in order to allow the fish a chance to reproduce itself. From the standpoint of a zoological curiosity alone a fish that has tide controlled spawning habits, and a marine fish that deposits its eggs on the land rather than the sea, is worth conserving. As a secondary reason, it is highly prized as a food fish. The problem is made the more difficult because of the rapidly increasing population of southern California. These same beaches that once supported enormous numbers of clams have been denuded of shell fish and it appears that the next natural resource to go will be the grunion unless protection is forthcoming.

TWO NEW FISH HATCHERIES.

Plans have been made for the construction of two new fish hatcheries to be constructed by the Pacific Gas and Electric Company under direction of the California Fish and Game Commission. A party of commission officials joined those of the public utilities corporation during the latter part of May in a trip to Pit River, Fall River and Hat Creek sections of Shasta County for the purpose of locating sites for the hatcheries. The more important of these hatcheries will be built upon a bench, five acres in extent, bordering Lake Britton and a short distance below Burney Falls. This site lies about six miles from the village of Burney, one-half mile from Burney Creek State Park and about the same distance from the main highway leading to the head of Lake Britton, where is located the intake of Pit River Power Plant No. 3 of the Pacific Gas and Electric Company. The hatchery will contain 100 troughs and be as large as most of the units in the standard hatcheries of the state. For the present this hatchery will be used solely for the propagation of trout.

The second site selected is at Hagan's Flats, near where the proposed Pit River Project No. 4 will stand when constructed. This hatchery will be a temporary structure designed to serve until after erection of the new No. 4 Power House. Between 50 and 60 troughs will be established in it and only chinook salmon will be propagated. Following completion of the new power house and the road leading thereto, the temporary hatchery will be converted into an egg-taking station for salmon, and the hatching will be done in greatly enlarged quarters at the Lake Britton site.

Mr. Downing agreed, upon the part of the Pacific Gas and Electric Company, to begin construction of the necessary hatchery buildings and cottages for commission employees in time for the annual take of chinook salmon eggs this fall. Proper racks and traps necessary to the egg take will be installed and everything made ready against the coming of the spawning season.

These hatcheries are required by law due to the erection of obstructions preventing the passage of chinook salmon and other fish peculiar to the waters of Pit River, Hat Creek, Fall River and their tributaries from the lower reaches to the old-time spawning beds, above the dams. These include the rainbow trout, chinook salmon, suckers, riffle pike, and several other species which belong to the minnow family.

Salmon, upon being hatched, will be released only in those reaches of the river below the power sites, to permit the young fish going to sea. The various forms of other fish taken and hatched will be released in water deemed most suitable therefor.

ECONOMIC VALUE OF THE MEXICAN FREE-TAILED BAT.

In California the Mexican free-tailed bat (*Tadarida mexicana*) occurs abundantly throughout the Upper and Lower Sonoran zones, from the southern border of the state northward at least to Marysville Buttes, Sutter County. Recently

four publications* have appeared dealing with the economic status of this bat.

Mr. Campbell's book is in part devoted to an attempt to show that the species is effective in controlling malaria by destroying *Anopheles*, the mosquito which other than man is the only host of the malaria parasite. The book also adduces evidence to show that bats can be successfully attracted to artificial roosts, thereby controlling malaria in a given region and at the same time producing a valuable return in guano, which is in demand as fertilizer. The sweeping assertions, the unscientific method of employing the facts and the inconsistencies within the book itself are seemingly sufficient to convince a trained biologist that the work is not to be relied upon; indeed statements in absolute contradiction of established facts frequently appear. The bats may eat mosquitoes, but numerous examinations of the feces from Dr. Campbell's bat roost by trained entomologists (see Storer) fail to reveal *any* mosquito remains. This proves that, at the time, mosquitoes were not a part of the food of the bats whose feces were examined, and to quote Mr. Goldman "* * * suggest that he (Dr. Campbell) may be mistaken in regard to the extent to which *Tadarida* feeds upon *Anopheles*, and in the general role of this bat in malaria control." Mr. Goldman also says, "While many bats may be useful insectivorous animals, the conclusions reached in regard to their value in the control of malaria based on such evidence are very unconvincing to those informed. The author has demonstrated that a bat roost with commercial possibilities as a fertilizer producer may be constructed under especially favorable conditions, but there can be no justification for his assumption that what has been done at Mitchell Lake can be done anywhere in the world, ignoring the distribution of species and environmental conditions in general. The public should be warned that the construction of expensive bat roosts even for guano production, should be undertaken only on the basis of expert knowledge of bats in their relation to local conditions. The unqualified recommendation (pp. 157–158) that every community, large and small, should have one or more of these bat roosts, which may cost from $2,500 to $3,500, would, if followed, mean in most cases a useless expenditure of funds and certain disappointment.

"The novelty and plausibility of the bat roost idea as presented are calculated to appeal to the imagination. Unfortunately, the book may be accepted at its face value by many who are unfamiliar with the fundamental biological principles involved and who can ill afford the loss of money invested in bat roosts, most of which, except in localities in certain regions only that are favorable for guano production, are sure to remain permanently empty."

If sufficient is learned of the habits of the bat and the conditions necessary for its existence to insure its colonizing in artificial roosts, such roosts should be of interest to citizens within certain local areas in California.

One of Dr. Campbell's bat roosts is apparently a paying proposition. However, according to Dr. Nelson, not one of the other seven bat roosts, distributed from Florida to Texas, have been taken up as an abode by bats. In short, although bats are eminently useful in controlling the numbers of many, mainly night flying, insects, and do provide an income in guano where they collect in large numbers, they have not as yet been proven to be an effective agent in control of malaria and have not been induced to enter man-made structures designed for them to an extent that warrants the erection of such structures, for the purpose of collecting guano.

In addition to the Mexican free-tailed bat there are no less than thirty other kinds of bats in California. In the warmer parts of the state it is believed by naturalists who have studied the problem that the number of bats is equal to the number of insectivorous birds. Despite their large numbers, bats are not well known to the average person; this is largely due to their crepuscula habits. All the bats in California are wholly insectivorous. As pointed out by Grinnell (Teacher's Bulletin, California Fish and Game Commission, No. 6, April 1916):

"Enough is known to make it certain that vast quantities of night-flying insects

*Campbell, Charles A. R.
1925. Bats, mosquitoes and dollars. The Stratford Company, Boston, Mass. pp. i–viii, 1–262, with unnumbered plates.
Goldman, E. A.
1926. Review of Campbell, Charles A. R. bats, mosquitoes and dollars. Journal of Mammalogy, 7 (2) pp. 136–138.
Nelson, Edward W.
1926. Bats in relation to the production of guano and the destruction of insects. United States Department of Agriculture, Department Bulletin No. 1395, pp. 1–11, figs. 1–4.
Storer, Tracy I.
1926. Bats, bat towers and mosquitoes. Journal Mammalogy, 7 (2) pp. 85–90, 1 plate.

are destroyed by the bats every twenty-four hours. It is further obvious that the kinds of insects thus affected by the bats are not at all the same as those combated by the diurnal birds. Thus it can be said that the role played by bats in their relation to insect repression is complementary to that played by birds in the daytime.

"By the farmer of intelligence bats should be looked upon not as ugly 'vermin,' but as desirable citizens. They do not harbor bed-bugs, but make way with destructive insect pests. They work the night shift."—E. R. Hall.

CONDITIONS AFFECTING MIGRATING WILD FOWL.

There are apparently two great adverse factors directly menacing the perpetuation of our migratory wild fowl, and these overshadow all others. One is the drainage of water areas by man, and the other is a succession of years of scanty rainfall, and its effect on a great area in the West, as indicated by the disappearance there of many ponds and small lakes.

In efforts to conserve the big-game animals of the country it has been found that man has occupied most of their former wintering grounds, and the great conservation problem has been one of sufficient winter forage, the summer forage being usually abundant. In the case of migratory wild fowl, there is arising a like problem—that of maintaining sufficient water areas where the birds may feed during their migration and in winter, but there must be retained undisturbed sufficient breeding grounds, the basis of all wild-fowl production.

The danger to the perpetuation of the stock of wild fowl is so great and so imminent from the causes mentioned that there is the most vital need for all conservationists and lovers of wild life to sink petty differences of opinion as to details and to unite in constructive work to insure the future of our migratory game birds.—Migratory Wild Fowl and Present Conditions Affecting Their Abundance, by Edward W. Nelson, Special Rpt. United States Dept. of Agriculture, Bureau of Biological Survey, Mar., 1926.

DESTRUCTION OF PREDATORY BIRDS.

A number of prominent ornithologists the country over are becoming greatly disturbed at the continued slaughter of predatory birds. The list of nearly a dozen names includes that of Witmer Stone, director of the Philadelphia Academy of Natural Sciences; W. DeW. Miller, associate curator of birds, American Museum of Natural History; Louis A. Fuertes, artist and ornithologist; Ernest Thompson Seton, artist and naturalist, and Gerald Thayer, artist and ornithologist. Included in this group are also the names of several nature writers, as, for instance, Samuel Scoville, Jr., and Thornton W. Burgess. This camppaign for education is also being promoted by the National Audubon Societies.

These men have issued an interesting, illustrated bulletin, entitled "Save These Birds." The men concerned have doubtless been driven to their present stand as a result of a notable decrease in various species. The leaflet has sufficient bearing on this much discussed problem to warrant its publication here. In order that every Californian may understand the present conditions in this state, it should be noted that the species of non-game birds, which have been most notably decreased in the past ten years, are white-tailed kite, osprey, prairie falcon, and red-bellied hawk—every one of them a so-called predatory bird. These same birds have long been protected by law, so the decrease is not due to a lack of legal protection but to the reputation given these birds by the gunner and the subsequent disregard of the law. The duck hawk, Cooper hawk, sharp-shinned hawk and horned owl are blacklisted by state law.

Contents of this bulletin follow:

SAVE THESE BIRDS.

By early writers the birds of prey were considered the highest type of bird life. Their strength and speed, their splendid flight and majestic mien go far toward justifying this opinion.

The eagle has been from time immemorial the symbol of power and might, and "the way of an eagle in the air" is still one of the unsolved mysteries. Even our familiar hawks, as the red-tail, are masters of the air, and John Burroughs, in one of his essays, has eulogized their aerial prowess.

The red-shouldered hawk, soaring and screaming over the winter meadows is, says C. C. Abbot, one of the few bits of primitive wildness left us.

The well known naturallst, W. H. Hudson, writes thus of the peregrine falcon or duck hawk: "This famed bird is of a handsome appearance, not swallow-like as is the kite, nor so massive as the eagle; but nature in fashioning it has observed the golden mean, and the result is a being so well-balanced in all its parts and so admirably adapted for speed, strength, and endurance, that to many minds it

has seemed the most perfect among winged creatures."

The owl, Minerva's bird, has for centuries been the symbol of wisdom. The barred owl is strangely human in voice and aspect, and the hooting of the great horned owl is one of the most solemn and impressive of all wild sounds.

These splendid birds have indeed fallen on evil days. They are now regarded as "vermin." Sportsmen demand their extermination.

The bald eagle, the emblem of our country, has a price on his head. The noble peregrine, which in the palmy days of falconry could be possessed by no one of lower rank than an earl, is now legitimate prey for anyone with a gun.

Other birds, too, the herons, the kingfisher and even the redheaded woodpecker, have come under the ban. Their beauty of form and color count for nothing. We have no more picturesque bird than the great blue heron. Either in flight or at rest its presence adds immeasurably to the scenic value of a lake or marsh, yet because he takes a small pay for his services he must be destroyed!

The damage done by crows has been greatly exaggerated and used as an excuse for their wholesale slaughter. One man reports the capture and killing of over 500 at one time by a new method of trapping. The crow is a conspicuous and attractive element in the landscape, particularly in the dreary months of winter. Who would not miss the sight of "the black'ning trains of crows to their repose?"

Is it not high time that the nature lovers of this country asserted their right to a share in its wild life? Are we not justified in demanding that our rights, and those of our successors, to the enjoyment of these marvelous creatures be recognized?

Many of these species are already seriously diminished in numbers. Of late years the killing of hawks with guns and traps has been carried on in a wholesale manner. Hundreds of migrating hawks are killed in a single day; for example, 900 on one September day in southern New Jersey. Men who have been killing migrating hawks in the northeastern states for years past admit that for the last three or four seasons the flights have been conspicuously smaller than in former years.

About game farms constant warfare is waged on all species. Hundreds of traps are set in all directions for as much as two miles from the farm. The cruel and indiscriminate pole trap captures not only all kinds of hawks and owls, most of them useful species, but also many songbirds. Farmers are making a regular practice of trapping hawks during the winter, and nearly all of those captured are red-tails, red-shoulders, and rough-legs, all beneficial species. State game officials who ought to know better shut their eyes to the true nature of these birds, and the old excuse that "a hawk is a hawk" serves to condemn them all.

As sportsmen increase in numbers, and sporting journals multiply, the propaganda against the birds of prey grows rapidly. New methods of slaughter are devised and advertised, while prizes and bounties stimulate destruction.

Fortunately we do not have to rest our case entirely on the scientific and esthetic value of these birds, weighty as these reasons are for the lover of nature.

The majority of the 50 species of hawks and owls of this country have been proven by the United States government to be mainly or wholly beneficial. Some 2700 individuals were examined by the Biological Survey, and the chief food of most species was found to be injurious rodents and insects.

More than half of the 41 species examined are so nearly guiltless that, of 1293 individuals belonging to 24 species, only four contained poultry and but three had eaten game birds.

The periodic plagues of mice in Great Britain are a matter of history. In the year 1580 and again at intervals during the next three centuries hordes of mice appeared in one or another part of England. They were invariably followed by great flights of owls, which entirely destroyed them. In 1892 great damage was done by a similar outbreak in the south of Scotland and the preponderance of opinion among the farmers, as quoted in an official report, *traced the scourge to the scarcity of hawks, owls, weasels and similar rodent destroyers.*

Most of us have no objection to legitimate hunting when game is abundant and the supply is not depleted. But the present practice of sportsmen who seek to remedy scarcity of game, brought about through excessive hunting, by endeavoring to exterminate scores of beautiful and valuable species is indefensible.

In Great Britain, as a result of the "pheasant worship" so deplored by Hudson, most of the native hawks have been nearly or quite extirpated. Our graceful marsh hawk, our soaring buzzard hawks, our splendid duck hawk or peregrine, will be but memories if the slaughter goes on unchecked. The bald eagle is already so rare that the sight of one is an event. The innocent long-eared owl and the valuable rough-legged hawk are but a remnant of their former numbers.

The more useful species of hawks and owls are legally protected in certain states, but it is to be feared that the protection is largely nominal. In other states even these beneficial species, and the great blue heron also, are outlawed.

Unfortunately no raptorial birds are protected by the federal law, although certain species are both more migratory and more insectivorous than many of the species covered by this statute, and their value should be legally recognized.

Let our bird protection be sane and reasonable. Even those species of hawks

and owls that kill many small birds are not enemies of the song birds, but on the contrary are of benefit to the species, killing as they do, mainly the weaklings. The number of the smaller species can not possibly increase beyond certain limits, and only the surplus is taken by predatory animals. Our abuse of these interesting wild creatures as "murderers" and "convicted felons" is creditable neither to our intelligence nor to our love of nature.

The obvious duty of societies organized for the protection of birds is to work for the preservation of those species that are in special need of defense.

The fight for our song birds has been fought and won. Gulls and terns, once nearly exterminated for millinery purposes, are once more abundant. Sanctuaries for herons, egrets, and ibises in the south are saving these birds from extermination.

It is now the hawks, the owls, the great blue heron, and other birds against which campaigns are being waged, that must be the object of active protective work.

Bird-protection organizations, supported by the nature-loving public, are the logical force to combat the widespread ignorance and prejudice regarding the birds of prey.

The economic importance of most of our commoner species of hawks and owls is shown by the following records. All except the "pellet" statistics are from Fisher's "Hawks and Owls of the United States in Their Relation to Agriculture."

Broad-winged hawk, 65 specimens. Not one contained poultry or game; only two had small birds. The rest contained mice and other small mammals, reptiles, batrachians, insects and other invertebrates.

Red-shouldered hawk, 320 specimens. Two contained poultry and one had game. The rest held mice, reptiles, batrachians, insects, etc.

Rough-legged hawk, 49 specimens. Forty held mice, most of them having from three to eight mice apiece. Not one contained birds or game of any kind.

Sparrow hawks, 320 specimens. One had a game bird, none poultry; 215 held insects; 101 mice and other small mammals. (29 empty.)

Barn owl, 39 individuals. One held a pigeon, none had game; 24 contained rats, mice or other small mammals. A large lot of cast "pellets" of this owl collected at Washington, D. C., contained 3100 skulls, of which 3004 were mammals (1987 field mice, 656 house mice, and 210 brown rats).

Long-eared owl, 107 individuals. One contained a game bird; 84 held mice (15 empty). The contents of a number of lots of long-eared owl "pellets" gathered in various parts of northern New Jersey was as follows: Mice and rats, 9852; other small mammals, 697; birds, 296. Among the mammals there was but one cottontail rabbit, a young individual, and not a single gray squirrel. There were no game birds, and no poultry, the great majority of the birds being small sparrows of various kinds.

Short-eared owl, 101 individuals. None contained poultry or game: 77 held mice.

Screech owl, 255 individuals. One had eaten a pigeon; none contained game. About 100 had small mammals, chiefly mice, and 100 held insects.

GOLDEN EAGLE EXTERMINATION IN ENGLAND.

In the British Isles the control of certain predatory animals has reached, and in the case of several species has exceeded, the states of "control" reached in western North America. From the Thirty-fifth Annual Report of the Royal Society for the Protection of Birds we learn that within the last few years the white-tailed eagle has entirely disappeared throughout many regions. Likewise, the osprey has gone. Now, due largely to poisons put out by game keepers, the golden eagle is threatened and its numbers have been so far reduced that its survival is doubtful. In fact this species has been extirpated in England and Ireland and remains only in certain small portions of the British Isles.

It is on account of just such results as these in other areas that the California Fish and Game Commission has temporarily refused to issue permits for the use of poison in game refuges, other than for the useful methods of control of ground squirrels, until the results of an investigation to be undertaken soon by Mr. Joseph Dixon in the interests of both the U. S. Biological Survey and the National Fur Association are available. This investigation is expected to determine, among other things, the effects of poisons on wild life other than that for which the poisons were intended, particularly the effects on fur-bearing mammals.—E. R. H.

RUFFED GROUSE DISEASE.

For several years past the sportsmen of the eastern United States have worried over the decrease in ruffed grouse and the evidences of disease which have been found. During the past year a committee, appointed to investigate the disease, has employed Doctor Alfred O. Gross of the Roosevelt Wild Life Experiment Station of the New York State College of Forestry at Syracuse, and his preliminary report has recently been published. An examination of numerous specimens has shown the occurrence of three hitherto unreported diseases of ruffed grouse in the wild state, namely,

tuberculosis, pulmonary mycosis, and a third disease as yet not identified. Heretofore, it has been thought that a certain stomach worm infesting grouse was largely responsible for the fluctuation or periodical decrease in the numbers of birds. It now appears that the newfound diseases may play a more important role than was at first suspected and thus complicate the problem. Of 17 specimens of diseased grouse examined, six were infested with the stomach worm, three gave positive evidence of tuberculosis, two of pulmonary mycosis. As a result of his studies, the author draws attention to the surprising number of diseases in the small number of specimens examined and emphasizes the importance of making autopsies of the entire bird. Examinations of large numbers of specimens extending over a period of several years must be completed before generalizations securing conservation of the ruffed grouse can be made.

SAN BENITO COUNTY RECEIVES MEXICAN BOB WHITE QUAIL.

Fifty-two Mexican bob white quail, purchased from breeders in Mississippi by the San Benito County Fish and Game Protective Association, arrived February 28 with loss of twelve birds. They were held until acclimated and then released along the San Benito River, near Hollister. Ranchers have promised to assist in protecting them. Thirty were released on the Carr Ranch, and ten on Santa Ana Creek. A second shipment of seventeen to replace the dead birds of the first shipment arrived later, and after being held two weeks were liberated on the Carr Ranch.

Later news is to the effect that several pairs mated and are nesting. As evidence, eggs from a deserted nest were sent to the Fish and Game Commission in San Francisco.

COMMITTEE TO STUDY GAME CONDITIONS.

A study committee has been formed by the Conservation Department of the California Development Association to make a survey of the fish and game problems of the state. Members of this committee are:

Chairman, Albert Lindley, Stockton; vice chairmen, Earl R. Kauffman and Henry W. Keller; secretary, Charles G. Dunwoody; A. E. Dalton, Dr. E. F. Auble, Henry Garrison, James N. Proctor, V. A. Hart, S. N. Barnhart, Harry Ridgway, Thomas J. West, Sherwood Green, Manly Harris, J. Sub Johnson, Judge L. C. McCloud, Dr. Barton W. Evermann.

This committee will be assisted, when necessary, by an advisory committee of other members, and the results of these investigations will be used to guide the future policy as regards fish and game resources.

EXCEEDING BAG LIMITS.

A listening ear among sportsmen groups in California will quickly pick up an undercurrent of criticism against activities on gun club grounds. At first one might think that these criticisms were the result of jealousies and came entirely from outsiders who were affected by the poorer shooting afforded on open grounds. However, analysis will show that in reality many members of gun clubs deplore the fact that bag limits are exceeded frequently and that the policy of piecing out bag limits by the work of the "keeper" is a common one. Members of gun clubs usually set themselves up as being the best type of sportsman in the state, and we wonder whether they ever think of the example they set to the would-be sportsman by allowing violations of the gun laws on their club grounds.

Another common undercurrent of feeling is the unfounded rumor that game wardens carefully avoid convictions on club grounds and spend their time patrolling roadways surrounding the grounds purposely to stand in with the gun club members. Of course when attempts are made to get proof on any such statement, it is not forthcoming.

Unfortunately, such accusations as stated above only apply in a few instances for more and more on club grounds the members are held to strict rules, and furthermore as a rule, there are only two hunting days a week against the seven days that are often utilized by the free hunter. Nevertheless, there should be less basis for such criticism and every club should have rules which come definitely within the law and should see that they are enforced by their own officers without securing the help of the nearest game warden.

HUMANE CAPTURE OF FUR-BEARERS.

A new organization, sponsored by the American Humane Association, is planning a nation-wide campaign to bring about more humane methods in the capture of fur-bearing animals. The headquarters of the new organization will probably be in the national capital, and

the movement is designed to bring about reforms in the present methods of taking furs, and in educating the public along constructive and economic lines.

COMMON SENSE VS. SENTIMENTALISM IN RELATION TO SPORTS.

Dreamers are beginning to envision a new golden age when firearms and fishing tackle will be known only as relics of barbarism, and when the perfected superman shall have abolished the struggle for existence, and all organisms from the microbe to mammal may be indefinitely sustained on a synthetic elixir of life.

No doubt, by that time the superman can solve the problem of the congestion of living things that will then exist in a better way than that chosen by the Creator.

Humanity has been crawfishing towards a higher state of civilization with amazing rapidity these thousands of years, but the goal of an ideal and consistent existence is a long, long way up the road yet. At the present time our strivings for an Utopian condition of society are filled with contradictions and inconsistencies. Perhaps this but emphasizes the fact that we are on our way. However, it might be just as well to strive for consistency in our progress and move forward with understanding and with some degree of recognition of the stage we have reached in our long journey.

The sensibilities of some persons seem periodically to undergo a severe trial. At one season the anglers are found over the country lugging around their allegedly torturous paraphernalia; at another season the hunters roam the fields and hills with their guns, also allegedly torturous. And at such times there is always someone lamenting the cruelty of hunting and fishing.

The animals of the wild places appeal to the sentiment of people. And it is right that they should. However, sentimentality is entirely a different matter.

Many wax indignant over the killing of wild life by the hunter or fisherman, yet the processes of our slaughter houses and our own back-yard butcherings do not trouble them in the least. When it comes time to kill Johnny's pet rabbit for the Sunday dinner it is only a matter to be handled with diplomacy and with as much dispatch as possible. Of course, Johnny may think it cruel, and, strange as it may seem to those who pretend to see cruelty in the shooting of a wild rabbit, the sportsman himself is likely to agree with Johnny. The true sportsman can not help but feel that the animal is being betrayed; it has learned to trust its human friends, only to meet death at the hands that have caressed it. Yet those who condemn hunting and fishing condone this betrayal as being the God-given right of mankind.

While we may betray trusting domestic animals without protest, we can not pursue the wild birds of the air or the beasts of the fields or the fish of the streams where the animals pursued have a chance to outwit or escape the pursuer without bringing down upon our heads a shower of protests that the killing is cruel. The killing that is done by the hunter or fisherman is the most merciful of all, and the fairest of all.

A sportsman may be cruel, but most sportsmen are not, and certainly all deserving the name are not.

To the wild animal whose life is one long struggle against its enemies, and whose life almost without exception comes to a violent end in the course of nature, the pursuit by the hunter is but an incident of its existence. In facing this danger the animal maintains what freedom it possesses or can possess. The domestic animal has no freedom and finds its death not at the hands of an enemy who may be escaped but at the hands of a friend who can not be escaped.

Does it render a humane service to the deer to allow it to run unmolested by rifle ball only to fall a prey to the mountain lion—which also, under the plan of the hyper-idealist, would be permitted to multiply? If the deer could choose, would it accept death from fang and claw, an always present danger, in preference to death by the swifter and more merciful bullet during a few days in the year?

Wild life always has existed under the law of the survival of the fittest, and it will continue to do so for a long time to come. And man will continue to eat meat. These facts will remain facts for many a generation. Why not admit it and act accordingly?

This is not a plea for the pensioning of domestic animals, but rather for a sensible view of hunting and fishing, and for a realization that it is not cruelty to perpetuate hunting and fishing as sports. The sport is not in the killing—all sportsmen will agree to that. The killing is incidental and serves exactly the same purpose as the killing of domestic animals—the providing of food.

Hunting and fishing form the more humane method of obtaining meat for the table, although the demands of mankind

for animal food makes the slaughter house and the back-yard butcherings necessary. It is more sportsman-like and more humane to take the gun or fishing rod and go out into the open in pursuit of game than to take the ax or cudgel and go out to the poultry yard or rabbit hutches.

More attention should be given to the propagation of wild life and its conservation, if for no other reason than that for which domestic animals are propagated and maintained—the stocking of the larder. The wild game would make it possible occasionally to supply the family with delicacies without paying high tribute to the butcher, which would be a genuine satisfaction.

But a more important reason for the maintenance of wild life lies in the benefits that come as by-products of the hunt and the fishing trip. There is more blessing for the human being in bringing down a wily old mallard with a gun that must be handled with skill to turn the trick, and all that such a performance implies and demands than in decapitating a pet chicken with an ax. And the bird would prefer the former death to the latter.

Long life to hunting and fishing!—*Forest and Stream*, September, 1925.

RECREATIONAL LANDS.

Dr. J. N. Lowe, in an article entitled "Land Utilization" in the March number of *Development Bureau News*, Upper Peninsula, Michigan, presents much food for thought in his discussion of the relative amount of land that should be set aside for recreational purposes. This includes game refuges. The amount is tentatively set at 7 per cent of a given area, in this case, Michigan. The following quotation indicates that California stands second in relative amount of land set aside for such purposes:

"California comes second with 1,900,000, or 1.9 per cent, without the federal reserves, but if these are included, 3 per cent of its lands are in game refuges. Wisconsin has 19,335 acres, or about .19 per cent, and Pennsylvania has 76,317 acres or .26 per cent."

State.	Acres in Game Refuges.	Pct.
Minnesota	2,843,000	5.04
California	1,900,000	1.90
Michigan	272,559.53	.74
Pennsylvania	76,317.70	.26
Wisconsin	69,335	.19
Vermont	10,888	.18

NEW BOTANICAL GARDEN.

Mrs. Dorinda Blaksly-Bliss has donated fifteen acres of land in Mission Canyon, Santa Barbara, for the establishment of the Blaksly Botanical Garden. It is a wonderful thing to have on display plants and trees from the world over. Likewise it is a wonderful thing when, through the establishment of a zoological park, people are able to study live animals rather than stuffed specimens in a museum. Fortunately, in spite of the fact that there is only one outstanding zoological garden, that at San Diego, there is an increasing interest in animal life in California. An incipient zoo is to be found in Oakland's new park in Redwood Canyon.

BOY SCOUTS MAKE GAME CASE.

On July 9, 1924, the following boy scouts: C. A. Lamb, scout master from Orange County; Leon Atwood, Jr., of San Bernardino; Wayburn Wolff of Redlands, Wiley Searing of Redlands, Henry Cross of Redlands and Roy Cross of Redlands were camping at Dollar Lake. While they were scouting around they found three fresh deer hides. Noting the tracks of some pack animals that had left the spot, they followed the tracks over the trail from Dollar Lake to Barton Flats, where the pack animals took the old cattle thieves' trail, not shown on the government map. They then went to the forest ranger and reported their find to him. He got in touch with the proprietor of Seven Oaks Resort, who in turn telephoned Mr. W. C. Malone, Deputy Fish and Game Commissioner, at 1 p.m. Mr. Malone immediately went to the ranger's station, viewed the hides and had a conversation with the scout master and a number of the boys. The boys were all worked up about this flagrant violation of the game law, as they had a right to be, since it was out of season and in the heart of Fish and Game Refuge No. 4-A.

After securing a search warrant the authorities followed the trail of the pack animals to the Mountain Home Resort Lodge, where Charlie Martin, owner of the ranch and former chief of police of San Bernardino, was placed under arrest. He afterwards pleaded guilty to "violation of the game law—venison in possession out of season in the game refuge," and was fined.

NEW TEACHERS' BULLETIN ON FISH AND GAME LAWS.

Bryant, Harold C. Fish and Game Laws and the Reasons for Them. State of California, Fish and Game Commission, Teachers' Bulletin, No. 8, pp. 1–7, April 24, 1926.

In preparing this bulletin Dr. Bryant has supplied to teachers a much needed resume of the fish and game laws of the State of California. Indeed, the need of a concise authoritative statement of this kind to place in the hands of students has of late repeatedly been expressed by teachers. Although designed for purposes of elementary education, adults, interested in laws designed to conserve wild life, will find much that is helpful in it.

The subject is dealt with under the following heads: History of Fish and Game legislation, Penalties, Law Enforcement, California Laws, Seasons, Open and Closed, Bag Limits, Size Limits, Methods, Nonsale, Pollution, Game Refuges, Game Farming, Federal Migratory Bird Treaty Act and Game Law Abstracts.

In the questionnaire at the end are sixteen questions which bring the more important provisions and principles underlying them into relief. This bulletin will, it is believed, be extremely helpful to any teacher directing a course of study in natural history or general biology.

Copies of this bulletin may be obtained free of charge from the Bureau of Education and Research, California Fish and Game Commission, Museum of Vertebrate Zoology, Berkeley, California.—E. Raymond Hall.

FACTS OF CURRENT INTEREST.

At the end of May the Department of Fishculture of the California Fish and Game Commission had over thirty-two and one-half million small trout and eggs on hand.

During the year ending December 31, 1925, 224,085 California angling licenses were issued. During the past year 226,421 hunting licenses were sold.

The influx of tourists to Yosemite this year is greater than ever before. The instruction given in natural history and conservation, by means of lectures, field trips, and motion pictures meets with the most hearty response. Similar opportunities are now being offered at California State Redwood Park.

The approaching dry season is one in which the moisture content of the duff on the forest floor is low and danger of forest fires is increased. Forest fires destroy game; they destroy the beauty and value of the region; they destroy seeds, seedlings and plant life; kill enormous quantities of growing timber; consume the leaf litter and humus on the forest floor; make deserts of thousands of acres of land; kill live stock, and destroy fences, buildings, crops and valuable property; sometimes they take human lives; they despoil your hunting grounds.

In addition to the $2,484,706 that California secures from the post office appropriation bill of February, 1925, for the construction of roads, the United States Forest Service has received $1,089,386 for the fiscal year beginning July 1, 1926. Of the latter amount $681,222 will be expended in the construction of major forest highways and $408,164 on minor roads and trails.

COMMISSION ACTIVITIES.

CABINET MEETINGS IMPROVE COOPERATION.

Various heads of departments have met regularly at cabinet meetings and a number of definite rules have been approved which will greatly improve the cooperation betweeu various departments, and in some instances will prevent duplication of work. Through these meetings department heads will be able to make the work under their supervision fit in with the general policy of the commission.

COMMISSION IN TOUCH WITH CONSERVATION CLUBS.

The commissioners and employees have continued to keep in touch with the numerous fish and game protective associations which are springing up in all parts of the state. On June 9 the commission was represented at an important meeting at Visalia of various conservation clubs of the south end of San Joaquin Valley. All of the associations are strongly in favor of real conservation and are looking with favor upon the present program of the Fish and Game Commission.

Department of Fishculture.

NEW POLICY OF FISH PLANTING.

The California Fish and Game Commission has placed itself on record as scrapping its former haphazard policy of fish planting. Beginning next year, the commission will plant trout only after a thorough survey has been made to determine the species best suited to particular waters, and the numbers required. The planting will then be done by reliable sportsmen's organizations, or sportsmen residing in the vicinity, with the assistance, and under the supervision, or an employee of the commission, trained in the art of fish planting.

The commission's decision is based upon an exhaustive report recently prepared by B. D. Marx Greene, executive officer, following an extended conference with W. H. Shebley, chief of the Fishculture Department. Mr. Greene declares that while many of the volunteer planting crews in California are doing their work in a splendid manner, the whole principle of the present planting system is wrong, and that it is as much the duty of the commission to properly plant streams and lakes as to rear healthy fish. His report commends many California sportsmen's clubs and individuals for splendid, though thankless, work in the past. The main reasons for, and some discussions of, this new policy are to be found in Mr. Greene's article, page 128 of this number.

This entire program has been adopted by the commission, and while it is too late to initiate it for this season's planting, the survey will begin at once with a view to putting it into effect next season.

NEW HATCHERIES PLANNED.

On May 21, Commissioner Zellerbach and other officials chose a site for the new trout hatchery on Burney Creek to be constructed by the Pacific Gas and Electric Company. A tentative agreement as to the details of construction is given on page 135 of this number.

Plans are being prepared for the new trout hatchery to be erected at Yosemite. Aquaria for exhibiting game fish will be one of the features of the new hatchery.

HATCHERY NOTES.

Extensive repairs and improvements have been underway at the Mount Shasta Hatchery. Several ponds have been relined with planking and new settling tanks installed.

The take of rainbow eggs at the Klamath auxiliary stations was not as large as in former years owing to the water being too cold and too low, so that the spawning fish did not enter the tributary streams. Many fish spawned in the river rather than in the tributary streams. Snowfall and rainfall have been below normal in the Klamath region.

Last season one million steelhead trout eggs were collected from June Lake, Mono County. The spawning fish were seined from shallow water. This is a new source of supply.

The total distribution of salmon from the Fort Seward Hatchery for the past season was 1,998,000. The grand total of eggs handled at the Mount Shasta Hatchery during the month of April was 20,748,000.

Department of Commercial Fisheries.

SALMON AND STRIPED BASS INVESTIGATIONS.

Dr. J. O. Snyder, who has been directing these investigations, left during June to take charge of the marine biological laboratory of the U. S. Bureau of Fisheries at Woods Hole, Massachusetts. He will return in September to assist in the registration of zoology students at Stanford and then take active charge of the salmon and trout investigations on Klamath River. The university has given him leave of absence during the fall quarter for this work. As Dr. Snyder is acting head of the Department of Zoology at the university, we should consider ourselves fortunate to get so much of his time. As an illustration of the importance with which this work of Dr. Snyder's is regarded, the president of the university in his last annual report mentions the fishery work of Dr. Snyder and his field assistant, E. C. Scofield, for the Fish and Game Commission, as one of the principal research activities of the Department of Zoology. During Dr. Snyder's absence, the field work will be carried on by E. C. Scofield with G. H. Clark assisting.

The striped bass investigations being carried on by E. C. Scofield have progressed very satisfactorily. Due to the strike of river fishermen during the spawning run of bass, it was impossible to get the desired data on the age and size at which striped bass mature, but enough data was gathered through the efforts of Charles Bouton, captain of our patrol boat "Quinnat," and by hiring special fishemen, to make it reasonably certain that at least a majority of the bass mature in their fourth year and at a size which escapes through the nets of minimum sized mesh of five and one-half inches.

The work of tagging troll-caught salmon continued to be a disappointment in June due to the failure of commercial trollers to catch the fish in sufficient numbers. This work is being carried on by Paul Bonnot and one assistant at Eureka, where the best catches of salmon have been made.

A number of complaints and two petitions have been received by the Commercial Fisheries Department telling of the depredations of seals and sea lions in southern California. They ask that the protection given these mammals in southern California be withdrawn so that they may be killed. Part of the present agitation was started as a result of propaganda by a man formerly employed in sea lion killing by the state of Oregon. More information as to the food of sea lions is needed, and the Commercial Fisheries Department plans to detail a man to gather additional facts as to the abundance, distribution and food of these animals.

The Special Libraries Association of Southern California held its March meeting in the library of the California State Fisheries Laboratory. After the business had been disposed of, Mr. W. L. Scofield, now in charge of the laboratory, gave a resume of the scientific work being done by the California Fish and Game Commission, in which the librarians expressed considerable interest. Their organization is composed of university, medical, business, and museum librarians, many of whom have an opportunity to spread conservation propaganda among the sections of the reading public which they serve.—R. M. Thompson.

During June the tuna season began in southern California, and data will be collected on albacore during the next three months by Mr. Van Deventer under the direction of the Fisheries Laboratory, in connection with the albacore conservation program which has now been carried on for several years.

Bureau of Screens and Ladders.

A new Bureau of Screens and Ladders has been created with Mr. John Spencer in charge. For the past six years, Mr. Spencer has been with the California Railroad Commission in the hydraulic division. Mr. Spencer was first lieutenant in the Engineering Corps of the army during the war and for nine years previous to that time was superintendent of engineering on irrigation and domestic water systems, and in particular had charge of the water division of the Pacific Gas and Electric Company centering out of Auburn. Mr. Spencer brings to the commission a vast experience and a most pleasing personality. Work is already under way and much is to be hoped from this department in the near future.

A joint investigation, covering a period of thirty days, will be made by a committee consisting of representatives of the

U. S. Bureau of Fisheries, of a power company, Associated Sportsmen's Clubs, and of the Fish and Game Commission to determine whether trout of a non-migratory type are drawn into the turbines of a power plant. Racks and traps will be installed below the power plant at Hat River No. 1 and a watch kept for trout that might pass through the conduit. This investigation should give data as to the necessity of screening the inlets to the turbines of power plants.

Bureau of Pollution.

To clean up the many instances of pollution in streams and coastal waters seemed an insurmountable task until undertaken systematically by a separate bureau. A better understanding of the magnitude of the work is in evidence when the various sources of pollution are named: distilleries, gas plants, lumber mills, mines, oil refineries, slaughter houses, and tanneries. However, systematic endeavor is bringing worth while results, for every monthly report shows numerous inspections made and many actual clean-ups reported. Those cases which needed action have received quick trial and speedy settlement. In most instances, however, corporations have been found ready to cooperate with the commission in what they understand is necessary for the welfare of fish and fisheries in the state.

Companies in the Ventura oil field have agreed to place new flumes and pipe lines together with new sumps to prevent further pollution of the Ventura River.

Bureau of Finance and Accounts

A heavy sale of angling licenses was reported for May by the Bureau of Finance and Accounts. The total angling license sales for the year ending December 31, 1925, was $232,501. Of this amount $218,224 accrued from licenses sold to citizens of California, $4,221 from licenses sold to nonresidents, and $10,056 from licenses to aliens. One hundred and two licenses were issued to veterans of the Civil War.

Bureau of Education and Research.

Dr. H. C. Bryant reports large crowds at the Yosemite National Park this year. His lectures have been well attended. In fact, he and his assistants have all the work that they can handle.

Classes are taken to the various points of interest and are shown the local fauna and flora. The interest shown by all is very gratifying.

Bureau of Publicity.

The Bureau of Publicity is issuing regularly to all important newspapers in the state, stories which tend to inform the public of the activities of the commission and teach respect for fish and game laws. Newspapers are using the news items without cutting.

Bureau of Game Farms.

Weather conditions at the Game Farm during the month of June were ideal for bird propagation. The growth and development of birds was normal in every way. As it was found impossible to cultivate the ground and seed it, dry pens were resorted to. It was necessary to purchase lettuce in large quantities to feed both young and old birds. In another year, the grain feed for the birds will be produced in the pens. The domestic hens utilized in hatching the eggs will be held over and will furnish the eggs necessary for food. Besides kale and rape as green feed and cover, buckwheat will be planted in the pens next year. Experiments will also be made with proso, a feed said to furnish the main diet of game birds in Russia and said to be ideal for use at game farms.

During the early fall breeding birds will be chosen and the surplus stock planted on ground that has first been inspected and found suitable.

The breeding stock at the Yountville Game Farm has been producing eggs in the expected number. By the first of June 5500 pheasant eggs had been laid. 1809 birds hatched and placed in rearing pens, while 2081 eggs were still incubating. A number of eggs were infertile and some young birds were lost as a result of the large hens necessarily used in hatching. Later incubators were used with good success, since the loss from being "killed in the nest" was much less among the newly hatched birds.

A splendid stock of Mongolian pheasants, furnished by the state of Washington, has furnished sufficient eggs to bring the stock up to 300.

Quail have done exceptionally well. By the first of September the young birds reared will be mature.

Little was expected from the two pairs of Hungarian partridges, yet the one mated female laid seventeen eggs and a few birds were hatched.

FIG. 28. Superintendent Bade, State Game Farm, Yountville, California, placing ring-necked pheasant eggs in nest for hatching by hens.

Several varieties of pheasants are now on display at the Game Farm. Included are ring-necked, Mongolian, golden, silver, Reeves and Lade Amherst. Young of both the golden and silver have been hatched.

The stock of ring-necked pheasants given by the state of Oregon is that of birds imported from China three years ago. It is therefore pure stock.

Department of Patrol.

Following the civil service examinations given this past spring, an eligible list has now been established from which appointments can be made. What little reorganization that was necessary has been accomplished with little or no disturbance of the actual patrol work.

J. H. Sanders, a thoroughly competent officer, who for a number of years has been in the employ of the commission, has been appointed captain of the district

comprising Lassen, Plumas, Sierra, upper Nevada, Placer and El Dorado counties.

Chief of patrol, J. S. Hunter, traveled nearly 3000 miles in organizing and supervising the work of deputies during the month of May.

COMMISSION EMPLOYEES SAVE TROUT.

Numerous storms in San Bernardino County caused Big Bear Lake to rise rapidly the past spring. The traps were all in place and good takes of fish were resulting when this high water imperiled the fish in the traps as well as the 4,000,000 eggs incubated in the North Creek Hatchery. Deputies Ed Ricketts and R. J. Little worked with the superintendent of the hatchery for four days and nights in rain, snow, and sleet and finally saved most of the fish and all of the eggs. The traps had to be relogged higher up, and when the water went down in the tributary streams, thousands of fish were left stranded and had to be rescued. The run of fish into the streams during this high water was unusually large, as was also the average size of the fish—four pounds. Had it not been for the faithful service of these employees, a heavy loss would have resulted.

During June, 62 arrests were made and fines totalling $3,610 were collected. Deputy Johnson, of Napa, arrested a spotlight deer shooter and the defendant spent several weeks prior to his trial in the Napa County jail in default of $500 cash bail.

Included in the June seizures were: 50 pounds venison, 279 trout, 300 pounds barracuda, 144 dozen crabs, 86 abalones, and 6 cottontails.

State Lion Hunter.

During the first six months of this year, Jay Bruce, state lion hunter, killed 12 lions. Sick dogs have handicapped him for several weeks, but by the end of the year he expects to kill sufficient lions to bring his average up to the usual number of 32 or 33. Mr. Manly Harris of the Motor Body Corporation is much interested in Bruce's work and has very generously presented him with a new machine. It has a special built camping body and is equipped with a Ford motor, and gears which will enable it to go anywhere in the mountainous districts of the state.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

It is the opinion of William F. Herrington, assistant fisheries biologist of the State Fish and Game Commission, that the valuable Pismo clam fishery of San Luis Obispo County, instead of being in a very prosperous condition, as is the belief of most of the people in the Pismo beach region, is, in fact, well on the road to extermination. The article in this number of California Fish and Game by Mr. Herrington describes how for years a census of the clam population on the San Luis Obispo beaches has been taken by members of the staff of the California State Fisheries Laboratory at San Pedro. These studies have disclosed the fact that the year 1919 was an extraordinarily successful spawning year for the clams. The clams of that year class made up 90 per cent of all the clams found on the beach up until the year 1923, when they constituted 82 per cent of the total population. In 1924 this percentage dropped to 58 per cent and in 1925 dropped to 7 per cent. In other words, the 1919 year class has passed out with no other abundant year class to take its place. The year class of 1924, or those hatched in 1924, are only one-tenth as abundant as were the clams of the 1919 year class. As this 1924 crop will not reach the legal size for two or three more years and will then be relatively small in number, the Pismo clam fisheries face extermination unless drastic action is taken.

Herrington shows that the decrease in the number of clams on the beaches is not due to the activity of the commercial diggers, who can market only legal sized clams, but is almost entirely due to the activity of tourists and amateur diggers. During the three years 1923–1925 the census shows that the number of clams in one mile of beach was reduced by over 4,500,000 clams while during the same period the commercial diggers took less than 550,000 clams from all the beaches.

As the legal sized clams have about disappeared tourists and amateurs will be more inclined to take the clams which

have not yet reached the spawning age, and unless some better method of protecting the immature clams can be devised than has been possible in the past, the clams of San Luis Obispo County will, indeed, be virtually exterminated as were the clams on Long Beach, Anaheim Beach and other beaches where they were once abundant.

A QUESTIONNAIRE ON SALMON.

The following is an example of some of the questions that are received by our Commercial Fisheries Department for their attention. These questions are on salmon, of which there are five species found on the Pacific coast, and of these only two are common in California, the king salmon, variously known as the chinook, quinnat, or spring salmon; and the silver salmon, known also as coho and hookbill. The female silver salmon in the Eel River has sometimes been erroneously called blueback. This latter name is commonly applied to the sockeye, a red salmon of the north.

Thinking the answers to these questions may be of some interest we are printing them below:

1. How long do king salmon remain in fresh water after they are hatched, and on what do they feed?

The young of the king salmon migrate to the sea during the spring, shortly after they are hatched. A number of them remain over until the next winter before migrating, feeding on insects which drop in and float on the surface.

2. What are the enemies of salmon?

The enemies of the young in fresh water are numerous. Trout and other predaceous fishes; birds, like the heron and water ousel; snakes, etc., are some of them. The adults while they are in fresh water have few enemies other than man. Bears sometimes catch salmon as they pass over shallow riffles in their spawning migration. The enemies of salmon in the sea are thought to be the sea lions and birds like the murre and shag, but there is little evidence on the subject.

3. What causes the salmon to return to fresh water?

It is believed that salmon return and spawn in fresh water to get the young away from the more numerous enemies in the sea. It may be that salmon were originally strictly fresh water fish that have learned to extend their feeding grounds by going out into the sea. The fact that salmon eggs are killed by sea water might be used as an argument that the latter has happened. The salmon are guided by an instinct to enter or to leave the fresh water. The salmon, it has been pretty well proven, most all return to the parent stream.

4. What is the value of the Pacific coast salmon caught in one year?

The value, to the fishermen, of the salmon caught each year in California, Oregon, and Washington is about $4,000,000. The California catch is about one-fifth of that.

5. How high a waterfall will a salmon climb?

A king salmon, if it has a deep pool to leap from, can make a clear jump of from 12 to 15 feet in height. After making a good jump it may enter the fall several feet below its crest and be able to swim on up.

6. Do salmon always descend a river tail first?

They supposedly keep their heads to the current.

7. Do all salmon die soon after spawning?

It is believed they do.

8. When salmon are caught on a hook in the river, do they strike the hook in the spirit of combat?

Yes.

9. How can you tell the age of a fish?

By size of rings of growth on scales when viewed under a microscope.

10. What advantage is there to the salmon to spawn far up the river?

The advantage in spawning far up a river is to get the eggs and young above flood conditions and to give the young a longer time in the stream before they are washed out into the ocean. The eggs, if deposited in the gravel too far down stream, may be washed out or covered and killed by flood conditions. The young are not so apt to be washed down stream and the water will not be so muddy, thus enabling the fish to see their food. Muddy water causes them to drift with the current.

CASTING NETS.

Inquiries concerning casting nets are not infrequently received. From the questions asked it is inferred that little is known of the construction or operation of these nets.

A casting net is seldom used in California and never as a commercial proposition. It is used in the Hawaiian Islands and the well known photograph of a Hawaiian fisherman shows him about to make a throw with the net. It takes a good deal of skill to cast one of these small nets which is apparently more of a sporting proposition than anything else. The editor does not remember having

seen more than three of the nets. One was being used by a Japanese who was casting from a boat in the shallow water of the lower San Joaquin River for splittails and carp. One of the Duarte brothers at Monterey had one of these nets hung on his ceiling as an ornament, and an old German shoemaker of San Francisco had one which he desired to use in Clear Lake for carp.

One of the publications of the Bureau of Fisheries has an excellent description of how the net is operated, but it is difficult to explain to a person who has not seen the net. The net is shaped something like a parachute, the edge is weighted with small weights and from the edge of the net there are small ropes attached, each one of them so arranged that it will purse or draw up a part of the circumference of the net. These ropes then pass up through a small ring at the center of the net just as you might take the ropes on a parachute and pass them up through a hole in the top. The ropes practically fill the opening so that fish can not pass out. The net is cast with a circular motion so that it spreads out and lands like a blanket on the water. The weighted edges fall to the bottom first, then when the small ropes are pulled through the opening at the top of the net by one central line held in the hand, the edge of the net is pursed and pulled toward the center thus impounding the fish.

LIFE HISTORY NOTES.

BARBED WIRE FENCE CAUSES DEATH OF DEER.

Mr. William Lippincott, deputy fish and game warden, who secured and sent in the photograph reproduced here, writes that the deer is a four-point buck which lived only one or two days after being taken from the fence. He states that the antlers were knocked off in the deer's struggle to free itself and that in the photograph they can be seen lying on the ground.

According to Mr. Lippincott, this is a common occurrence and causes the death of many deer in his region. The writer's own observations of mule deer on the Kaibab Plateau of Arizona indicate that, of the several ways in which deer are injured and killed by accident, being caught in wire fences is a common one. The writer remembers particularly one doe, caught in the same manner as the buck shown in the accompanying photograph, that had evidently died from loss

FIG. 29. Four-point buck, Rocky Mountain mule deer, being removed from barbed wire fence in which it is caught, Yegg, Siskiyou County, California. March 28, 1926. Photograph by M. A. Rapalli.

of blood. This resulted from the numerous cuts on various parts of the body sustained in her attempts to get free from the barbed wire. In another instance a fawn, only a few weeks old, was found dead, hanging by one leg that was caught between two parallel limbs over which it, apparently, had tried to jump. The bounding gait and habit of jumping over, rather than going around, objects in its path would seemingly render this animal more subject to accidents of this kind than are other mammals. However, at least the mule deer, as determined from observation, especially when not frightened, goes under or through rather than over barbed wire fences.—E. Raymond Hall.

FORAGE HABITS OF POCKET GOPHER.

Near noon of June 6, 1926, after sitting motionless for a time in a shady spot in the Berkeley Hills, my attention was caught by a slight rustling in the grass near at hand. Turning, I was barely in time to see a California pocket gopher (*Thomomys bottae bottae*) retreat, backward, down a new burrow he had just broken through to the surface. Soon he reappeared, this time shoving a load of dirt ahead of him. After pushing out the third and last load he paused and cut, with his sharp incisors, one of the green, seed-bearing grass stems that grew to a height of seven or eight inches about the hole he had just made. While on his trip below ground with this grass stem I squirmed forward until my eyes were less than twenty-four inches from him when he next came to the mouth of the burrow. While I lay watching he made seven more trips to the surface. Each time he took one and only one stem of the grass. He secured each by turning his head a little to one side and cutting the stem, at a single bite, about one-half inch above the ground. Retreating backward, a short distance down the hole, he would drag a stem after him. One could then hear from four to eight clicks of his teeth as he, presumably, cut the plant into lengths appropriate for his use. Whether he stored these pieces in his cheek pouches as he cut them or left them in the burrow I could not tell. In each case it was only an instant after the clicks of his teeth ceased until he was back at the surface. Although he never came entirely out of the sloping burrow, he reached out on three sides of the opening to secure the grass stems, and in so doing sometimes exposed more than half the length of his body. Several times he looked directly at me, but failed to recognize me as a possible danger at which to take alarm, although he did appear to be on the watch for enemies.

On the eighth trip to the surface, just after he had cut off another grass stem, the breeze shifted and blew directly toward him from me. The gopher at once became suspicious. Turning in my direction he wiggled his nose pad to test the breeze and, deciding that it was unsafe to longer expose himself, hastily retreated below ground. Thus it would appear that the gopher's sense of smell is of no little aid to him in avoiding certain enemies. Certainly, in the case cited above, it was of more use than his sense of sight.

In less than a minute after his final disappearance he returned along the burrow pushing a load of loose dirt in front of him. This only partly filled the mouth of the hole. A second load completely closed the opening and a third made it fairly solid. Several minutes later I dug out the rather firmly packed soil he had placed in the hole and found that it extended six or seven inches down the burrow. Thus, I inferred that, in all, he had used more than three loads to construct his barricade.

In addition to the method of foraging described above, at least two other general methods of feeding on plants without the gopher exposing himself above ground are resorted to. One is, of course, eating, *in situ*, the tubers, roots, and parts of plants that normally grow underground. The third method, as observed in Shaw's pocket gopher (*Geomys bursarius*) by some students is that of tunneling beneath a plant, then pulling on the roots and dragging the whole below ground.—E. Raymond Hall.

RETURN ON BANDED GOOSE.

Through inquiry of Mr. George Thompson we learn that a cackling goose bearing band No. 302067 was killed by George Kluber on the Browning Ranch six miles west of Biggs, Butte County, California, October 25, 1924. The goose was banded July 31, 1924, less than three months before, at Kashunuk, Alaska, by Mr. O. J. Murie of the United States Bureau of Biological Survey.

BEAVER IN MODOC COUNTY.

The only representatives of the Rocky Mountain type of beaver found in the state are in Modoc County. There are some five different localities near the head of Pit River where beaver are still to be found. Should protection be removed

from these animals California would seem lose a few examples of the famous northern beaver of which she should be proud.

DESTRUCTION OF GOLDEN EAGLE IN CALIFORNIA.

The alarming decrease in numbers of the golden eagle, *Aquila chrysaetos*, in southern California is being noticed even by casual observers.

We have seen our California condor almost exterminated and at the present rate of destruction our golden eagle will be as scarce in a few years. I saw more California condors during a single day of the year 1913 in Santa Barbara County, than I have of the golden eagle in southern California during the first three months of the present year. During this first quarter of the year I have not only visited seven former nesting sites (only one being used), but have been in close proximity to others, and in country where they should be, and were formerly, numerous.

My opinion, based on evidence I have seen and on hearsay, is that most of the birds are accidentally caught in traps set for fox, etc. A few are shot by hunters.

Study should be made of trapping methods with a view of finding some methods which can be used without taking toll on our golden eagle. Publicity should be given to the matter and we should do all possible to see that our fast-vanishing golden eagle is protected.—Wilson C. Hanna, Colton, Cal.

CONSERVATION IN OTHER STATES.

ARKANSAS STILL HAS NO PROTECTION ON FISH.

In the April number of the *Arkansas Conservationist* several interesting observations are presented regarding the effects of lack of fish legislation in that state. Only a few years ago this state was far famed throughout the middle west for its excellent fishing. Now most of the streams are depleted. In an article by the editor of the magazine, Dr. H. S. Davis of the U. S. Bureau of Fisheries is quoted as follows:

"How can the people of Arkansas expect game fish to flourish in their streams when there are practically no restrictions on fishing, and any man can catch as many fish as he is able, at any time of the year, and in any manner he may choose to employ?

"It is true there is a law against dynamiting, but it appears that a limited force of game wardens makes enforcement impossible. This is the only restriction on fishing which the state has attempted. The people should realize that no matter how favorable the conditions, no species of fish can maintain itself unless sufficient numbers survive to perpetuate the species. Under present conditions in Arkansas, it is a very exceptional and lucky fish which is able to survive and propagate its kind. With all sorts of methods being used to capture fish, both large and small, the chance of any game fish reaching maturity is slight indeed."

In this same number we learn also that granting of police power to a warden rests entirely with the county sheriff of which county the game warden is a resident. In some counties, due to the hostile attitude of the sheriffs, game wardens actually are without police power.

By reason of the large amount of rugged mountainous territory in Arkansas that is not adapted to agriculture, game, as well as fish, is more plentiful than in most of the adjoining states. With the construction of good roads, sportsmen, and more particularly anglers, invade it from all sides. Under the present lack of restriction, depletion is progressing at a rapid rate. Arkansas, like many of the western states, also has its problems, resulting from reclamation projects. Large numbers of water fowl winter there, and at the present rate that artificial drainage is being carried on will soon be forced out with consequent overcrowding in other places, resulting as Dr. E. W. Nelson has recently shown, in death from disease. Their problems thus are of interstate nature and the Arkansas Game and Fish Commission and the few earnest individuals in that state who are actually working for better conditions there obviously have a hard row to hoe.—E. R. H.

MISSOURI INTRODUCES GAME.

From *Missouri Game and Fish News* (Vol. 1, No. 2, p. 7) we learn that:

"The department is pleased to report to the sportsmen of Missouri that 50 Virginia (white tail) deer have been imported to this state from Michigan at a cost of $2,500 and have been released in game refuges located in the Ellington State Park in Reynolds County and in

the Salem refuge in Dent County. The deer were brought here at a cost of $40 each plus transportation cost of $10 each, a total of $50 per deer.

"With a view to better propagation the department purchased the deer on a basis of one buck to two does. At the present time there are eight bucks and seventeen does at the Salem park and eight bucks and seventeen does at Ellington. All of the animals arrived at the parks in excellent condition."

On page 10 of the same publication we learn that native stock in some parts of the state is sufficiently abundant to be introduced into other parts of the state. Missouri has a closed season on deer until 1930. This fact together with—what is more important—the increasing number of game preserves throughout the state may be expected to cause an increase in the number of white-tailed deer of the area where early settlers found the animals in countless numbers.

NEW METHOD OF PREDATORY MAMMAL CONTROL.

What appears to be an innovation in predatory mammal control has been adopted by the Missouri Game and Fish Commission. From the June number of *Missouri Game and Fish News* we learn that complaint has been made against the presence of foxes in game preserves, and that it has been deemed proper to remove these mammals from said preserves. However, by reason of the large number of devotees that fox hunting, as a sport, has in Missouri, it has been decided that the foxes shall not be killed but shall be captured alive and removed to other areas. Since the preserves in question are said to be surrounded by a single strand of wire we are led to wonder how the foxes will be *kept* out. The fact, known to biological scientists, that a given area, of limited size, adapted to the needs of a particular species is soon restocked by that species after its sudden depletion, other conditions remaining the same, indicates what may be expected to happen with respect to the foxes. However questionable control measures of this kind are, they are certainly not the potential danger to the public welfare that promiscuous lethal measures are.—E. R. H.

STEELHEAD IS GAME FISH IN WASHINGTON.

The steelhead is a game fish when found above the mouth of any river flowing into salt water in the state of Washington, according to the opinion of Assistant Attorney General E. W. Anderson of that state. Some point on each river will be designated as the mouth of the stream.

This law passed at the recent special session of the Washington state legislature will make it necessary that fishermen catching these fish above the river mouth must have a game fish license and must observe the bag limits provided for game fish.—*The Oregon Sportsman.*

OIL POLLUTION.

From the thirty-fifth annual report of the Royal Society for the Protection of Birds, we learn that the society has taken active steps to do away with oil pollution of certain waters in the British Isles. We also learn that a motion was made during one of their meetings to arouse, if possible, public opinion in America on this question as they believe that "there was not really any lack of good will: for there (in America) they cared very much more about the subject."

California can well be congratulated upon its early activities in this matter since the newly organized Bureau of Pollution of the California Fish and Game Commission is designed to handle cases of this kind. Many cases have already been investigated by this bureau and often satisfactory arrangements have been made without taking the cases into court. Although cases handled in this way gain but slight recognition, their number is one measure of the bureau's success, for the expense saved the commission in not having to invoke the law, and the injury to aquatic life that is forestalled by immediate action, is great. —E. R. H.

NEVADA GAME REFUGE.

The governor of Nevada has recently proclaimed the establishment of a game refuge, 12 by 14 miles in extent, along the Idaho-Nevada state line, to be known as the Elko County Goose Creek State Recreation Ground and Game Refuge. This joins the Minidoka National Forest in Idaho, in that portion of which hunting is forbidden.—*The Oregon Sportsman.*

BIRD PROTECTION IN SWITZERLAND.

From the summary published in the March (1926) number of *Nos Oiseaux*, the organ of the Swiss Society for the Study and Protection of Birds, it appears that the new Federal Bird Protection Act of 1925 divides wild birds into two classes, (*a*) those which may be killed

in the open season by persons having permits, and (*b*) those which are to be protected all the year.

By virtue of these two articles in the law, remarks *Nos Oiseaux*, "all the little insectivorous and granivorous birds are protected, except the thrush, the fieldfare, and the sparrow," clause (*b*) comprising all species not mentioned in the first clause, whether resident, breeding, birds of passage, winter visitors, or casual visitors. The list of those only partially protected and regarded as "game," includes, not only such birds as pheasants, partridges, grouse, quail, etc., but also wild pigeons (except turtledove) and wild ducks, wild geese, woodcock, snipe, divers, grebes, rails, coot, moorhen, cormorant, golden eagle, goshawk, peregrine falcon, sparrowhawk, hobby, crow, hooded crow, rook, raven, magpie, jay, nuthatch (cassenoix), sparrow, thrush, and fieldfare.

All owls, buzzards, bitterns, and herons are among the protected, and also all the waders (except those specified), including redshank, sandpipers and plovers. Although the golden eagle may be killed in the shooting season, it is rigidly protected at its eyrie, and any person taking or acquiring or selling the eggs or young birds is subject to a heavy fine.

The confederation encourage by subsidies measures taken by the cantons for creating reserves, protecting woods and reed beds, provision of nesting boxes and food, etc.; and in concert with the forestry administration will facilitate the nesting of protected birds and the conservation of the trees they favor. The cantons have liberty to extend the measures of the law in various ways, such as lengthening the close time; forbidding battues, the use of motor boats for taking water birds, and Sunday and night shooting; adding to the list of fully protected species, etc.; information to be given to the federal council when such measures are adopted.

School children are to be taught to distinguish the protected birds, to know their utility and the duty of noninterference with them.—*Bird Notes and News*, Vol. 12, No. 1, p. 6.

REPORTS.

GAME CASES.

January-February-March, 1926.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Hunting License Act	24	$340 00	
Violations of Fur Trapping Regulations	5	80 00	
Deer: hunting, killing, possession; closed season	21	1,405 00	75
Deer: killing, possession; does, fawns, spike bucks	1	50 00	
Deer: skins, evidence of sex removed	1	25 00	
Ducks: over bag limit	2	90 00	
Ducks: killing, possession; closed season	8	250 00	
Mudhens: killing, possession; closed season	6	100 00	
Geese: over bag limit	2	75 00	
Geese: killing, possession; closed season	2	50 00	
Swans: killing, possession	4	115 00	
Shorebirds: killing, possession	1		
Quail: killing, possession; closed season	3	125 00	
Pheasants: killing, possession	7	525 00	25
Nongame birds: killing, possession	17	620 00	20
Rabbits: cottontail-brush; killing, possession, closed season	15	600 00	
Squirrels: (tree) killing, possession	2	175 00	
Shooting from automobile—power boat	8	165 00	
Night hunting	19	325 00	
Totals	148	$5,115 00	120

FISH CASES.

January-February-March, 1926.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Angling License Act	11	$225 00	
Violations of Commercial Fishing License Act	2	20 00	
Trout: closed season	11	415 00	
Trout: illegal spearing	2	50 00	
Crappie: closed season	1		20
Striped bass: undersized; over bag limit	16	800 00	
Striped bass: shipment out of state	2	25 00	10
Crabs: transporting out of district	1	40 00	
Clams: undersized; over bag limit	24	475 00	20
Abalones: closed season	21	580 00	
Abalones: undersized	24	610 00	
Lobsters: undersized	7	245 00	
Salmon: over bag limit	1	50 00	
Smelt: young of	1	20 00	
Illegal fishing: 250 feet of a fishway; 150 feet of a dam	2	20 00	
Illegal fishing: fish reservation	4	170 00	
Nets: illegal possession or use	14	1,850 00	
Totals	144	$5,595 00	50

SEIZURES OF FISH AND GAME.

January-February-March, 1926.

GAME		FISH	
Quail	4	Trout	102
Pheasant	2	Striped bass	433
Nongame birds	19	Pismo clams	85
Deer meat, pounds	690½	Crabs	1,004
Rabbits	31	Crab meat, pounds	2
Ducks	439	Abalone	493
Geese	45	Salmon, pounds	280
Robins	11	Lobsters	224
Deer hides	1	Nets	1
Mud hens	3	Smelt, pounds	35
Sea gulls	2	Sliced abalone, pounds	85
Swan	3	Shiners	2
Gray fox skin	1	Flounders	20
Squirrel	2	Crappie	1
Coyote furs	10	Pike	13
Skunk furs	1	Sandabs, pounds	4
Pigeons	2	Mackerel, pounds	5
Shore birds	4	Cans of trout	1
Mountain sheep head	1		

STATEMENT OF INCOME.

For the period January 1, 1926 to March 31, 1926.

	Detail	Total
License sales:		
Angling	$34,896 00	
Hunting	58,846 00	
Market fishermen's	4,220 00	
Trapping	607 00	
Wholesale fish packers' and shell fish dealers'	45 00	
Game breeders'	265 00	
Fish breeders'	60 00	
Kelp	10 00	
Total license sales		$98,949 00
Other income:		
Court fines	$10,060 00	
Fish packers' tax	18,219 20	
Kelp tax	60	
Fish tag sales	1,177 90	
Game tag sales	1 92	
Sale of beaver hides	180 00	
Sale of nets, line and other equipment	6 28	
Abalone inspection	499 22	
Interest on bank deposits		
Total other income		30,145 12
Total income		$129,094 12

STATEMENT OF EXPENDITURES.

For the Period January 1, 1926 to March 31, 1926 of the Seventy-seventh Fiscal Year.

Function	Materials and Supplies	Salaries and Wages	Service and Expense	Property and Equipment	Total
Administration:					
Commissioners			$171 06	$67 45	$238 51
Executive and legal	$27 70	$1,665 81	343 23	3 14	2,039 88
Clerical and office	337 74	5,098 38	786 52	486 44	6,709 08
Rent			3,049 46		3,049 46
Printing	277 65				277 65
Postage			936 31		936 31
Freight, cartage and express			277 32		277 32
Telephone and telegraph			884 54		884 54
Automobiles	21 19		21 95	1,651 89	1,695 03
Total administration	$664 28	$6,764 19	$6,470 39	$2,208 92	$16,107 78
Publicity and research:					
Director of education and research	$13 08	$275 00	$121 84	$5 70	$415 62
Director of publicity and pollution	13 40	1,374 37	172 61	4 75	1,565 13
Printing	4 40				4 40
Total publicity and research	$30 88	$1,649 37	$294 45	$10 45	$1,985 15
Conservation and protection:					
(Patrol and law enforcement)					
Chief and assistant		$1,123 26	$149 92		$1,273 18
Captains and deputies	$54 80	32,035 06	21,959 23		54,049 09
Patrol launches	160 89	310 00	92 81	$116 50	680 20
Clerical and office	49 90	1,090 00	5 00		1,144 90
Rent			163 60		163 60
Automobiles	87 76		110 90	17 05	215 71
(Protection)					
Lion hunter		375 00	44 72		419 72
Lion bounties			2,140 00		2,140 00
Total conservation and protection	$353 35	$34,933 32	$24,666 18	$133 55	$60,086 40
Commercial fisheries:					
Chief and assistants	$78 83	$1,573 32	$116 36	$2 97	$1,771 48
Deputies	38 16	7,450 06	1,357 33	66	8,846 21
Laboratory research	53 12	4,605 00	330 39	151 65	5,140 16
Statistical	6 32	1,000 00	45 01	99	1,052 32
Patrol launches	694 91	660 00	216 27		1,571 18
Salmon tagging			1 00		1 00
Total commercial fisheries	$871 34	$15,288 38	$2,066 36	$156 27	$18,382 35
Game propagation:					
Game farm maintenance and operation	$1,305 24	$1,205 81	$684 56	$1,234 76	$4,430 37
Additions and betterments				18,742 31	18,742 31
Total game propagation	$1,305 24	$1,205 81	$684 56	$19,977 07	$23,172 68
Fish culture:					
Chief of division		$933 32	$63 80		$997 12
Special field investigation	$111 35	2,090 65	313 63	$27 85	2,543 48
Clerical and office	31 87	1,175 00	13 10		1,219 97
Printing	88 95				88 95
Hatcheries	6,994 51	15,443 61	1,546 33	435 73	24,420 18
Automobiles	304 62		173 21	959 50	1,437 33
Rent			212 40		212 40
Total fish culture	$7,531 30	$19,642 58	$2,322 47	$1,423 08	$30,919 43
License commissions			$11,261 60		$11,261 60
Total expenditures	$10,756 39	$79,483 65	$47,766 01	$23,909 34	$161,915 39

CALIFORNIA FRESH FISHERY PRODUCTS FOR MONTHS OF JANUARY, FEBRUARY AND MARCH, 1926

By Fish and Game Commission
Department of Commercial Fisheries

Species of Fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Mexican, brought into California via San Pedro	Mexican, brought into California via San Diego	Total Mexican brought into California
Albacore											9,935			9,935			
Anchovies										5,779	52,189	201	109,377	167,546	442,873	70,163	513,036
Barracuda																	
Bluefish																	
Boccaccio																	
Bonito									11,105	1,246	9,886	509	9,625	32,371	7,930	11,597	19,527
Carp		13,465		2,542	10,042	16,366	302							42,717			
Catfish		89,277		125	10,053	2,203								101,658			
Chilipepper																	
Cultus Cod	563	275					103,539	4,600	18,490	12	467	383		128,329			
Dolphin																	
Eels							5						63	68			
Flounders	1,9710	270	30	30		316	96,703	7,956	8		232		42	125 297		22	22
Grayfish							133,401		11,287		10,373		45,117	200,178			
Greenfish																	
Hake							10,092							10,092			
Halibut							1,498	123	475	45,293	286,705	35,591	116,813	486,498	4,574	40,957	45,531
Hardhead					22,378									22,378			
Herring	6,175		1935			725	360,490			290			1,825	371,440			
Kingfish								21,164	17,050		134,193	537	1,600	174,544		125	125
Mackerel	378							175	421,684	2,783	405,030	61,545	238,226	1,129,821			
Mackerel,—Horse									262		5,827	391		6,480	315		315
Mullet											3,443	48	17,317	20,808		12,903	12,903
Perch	8,650		26,011			159	13,866	750	1,830	506	14,991	110		66,873	336	927	1,263
Pike				38	410	978								1,426			
Pompano											4,697		40	4,737			
Rock Bass											34,948	12,285	21,521	68,754	390	24,181	24,571
Rockfish	1,018	12,595					180,019	241,082	407,899	17,590	1,005,075	13,687	585,290	2,464.255		11,133	11,133
Sablefish							41,426	5,015	340	12	2,461			49,254			
Salmon				5,325	22,978	18,880	4,490		48					51 721			
Sandabs		12,940					358,283	6,500	138		3,274	147		381 282			
Sardines							522,980		57,824,995		85,522,581	710	10,604,406	153,875,672			
Sculpin											13,967	404	8,467	22,838			
Sea Bass—Black											6,048	143	12,542	18,733	1,271	48,125	49,396
Sea Bass—White								129	18	543	13,435	1,703	7,472	23,300	118 184	64,680	182,864
Sea Trout																	
Shad				374	726	6.062	62							7,224			
Shad—Buck				17,120	4,870	71,289								93 279			
Shad—Roe				20,279	3,867	106,458								130,604			
Sheepshead										201	20,671	20	3,802	24,694		200	200
Skates							63,003	750			13,333	15	10,905	88,006			

Smelt	11,613		7,408			404	23,756	34	1,605	16,947	97,692	14,801	4,399	178,659		210	210
Sole		66,670					1,961,430	32,828	4,486	22,381	5,939	877	1,844	2,096,455			
Splittail					2,964									2,964			
Striped Bass			966	30,124	54,873	223,195	32,161							341,319			
Stingaree																	
Suckers		348			360		43							751			
Surf Fish																	
Swordfish													500	500			
Tomcod							3,275	375						3,650			
Trout—Farm																	
Tront—Steelhead																	
Tuna											13,715			13,715			
Tuna—Bluefin											1,078			1,078			
Tuna—Yellowfin											52,620			52,620	39,655	525,790	565,445
Turbot			159											159			
Whitebait	2,944		4,166			105								7,215			
Whitefish											112,661	227	28,770	141,658	151	4,331	4,482
Yellowtail											5,243	484	75,777	81,504	137,262	188,516	325,778
Miscellaneous	409	16,061			115	462	1,502		1,491	4,609	22,450	2,148		49,247	20,575		20,575
Total fish	51,460	211,901	40,675	75,957	133,636	447,602	3,912,326	321,481	58,723,673	118,192	87,886,280	147,326	11,305,740	163,376,249	773,516	1,051,574	1,825,090
Crustaceans																	
Crabs	[1]68,664	[2]1,440	[3]7,584				[4]1,217,496	[5]28,368	[7]2,712					[8]1,326,264			
Ecrevisse																	
Shrimps			102,050			1,200	89,957							193,207			
Spiny Lobsters										9,032	31,474	4,074	36,476	81,056	23,357	267,453	290,810
Mollusks																	
Abalones									103,425	2,341				105,766			
Clams—Cockle			11,973											11,973	1,272		1,272
Clams—Mixed	5,195	584	1,363											7,142	3,514		3,514
Clams—Pismo										56,526				56,526			
Clams—Softshell			24,240			28,573	12,428							65,241			
Cuttlefish							1,667	3,957	15,686		119			21,429			
Limpets																	
Mussels							2,397							2,397			
Oysters—Eastern							[6]150,095							[9]150,095			
Oysters—Native															360		360
Snails																	
Squid									40,578				8,402	48,980			
Miscellaneous																	
Frogs (doz.)																	
Terrapins (doz.)																	
Turtles																	
Totals	125,319	213,925	187,885	75,957	133,636	477,375	5,386,366	353,806	58,886,074	186,091	87,917,873	151,400	11,350,618	165,446,325	802,019	1,319,027	2,121,046

All amounts shown in pounds unless otherwise specified. Albacore and skipjack cleaned.
All other fish in round.

[1] 2,861 dozen
[2] 60 dozen
[3] 316 dozen
[4] 50,729 dozen
[5] 682 250 shell oysters
[6] 1,182 dozen
[7] 113 dozen
[8] 55,261 dozen
[9] 682,250 shell oysters

46333 8-26 7500

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 12 SACRAMENTO, OCTOBER, 1926 Number 4

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THE CONSERVATION OF THE GRUNION.*

By Frances N. Clark.

During the spring months of each year, a popular pastime for people who have ready access to the beaches of southern California, is grunion fishing. The lure of the beaches on moonlight nights and the novelty of picking up from the sand these very lively fish, cause vast crowds to gather when an abundant grunion run is expected. The beach towns appreciate the economic value of the large groups of people thus attracted to the beach and, to encourage their coming, local newspapers carry notices of the time of expected runs. The importance of grunion, therefore, is twofold: they benefit the coastal towns of southern Cali-

*Contribution No. 63 from the California State Fisheries Laboratory. August, 1926.

fornia by furnishing one more inducement to bring people to the beach, and also the people, both by furnishing a tasty addition to the beach supper or next morning's breakfast, and by supplying a novel form of recreation. For these reasons, the question of the conservation of this unique fish is of interest to all.

What effect the taking of these fish in such large numbers has had on the ultimate supply and what can be done to assure a continuance of the grunion runs must be considered. For a clear understanding of this problem it is necessary to know something about when the grunion can be expected to appear, and why they are to be found only on nights immediately following the high series of tides. From the work of Thompson [1] and Clark [2] the following facts are cited to explain when and why the fish make their appearance.

The grunion belongs to the family of fishes known scientifically as Atherinidae, and popularly as silver-side, or, erroneously, smelt. The fish appear on the beaches from March to August, although the largest runs occur with the favorable tides during April, May and June. The fish are to be found in the surf and on the beach for three or four nights following the full and dark of the moon. Since the heights of

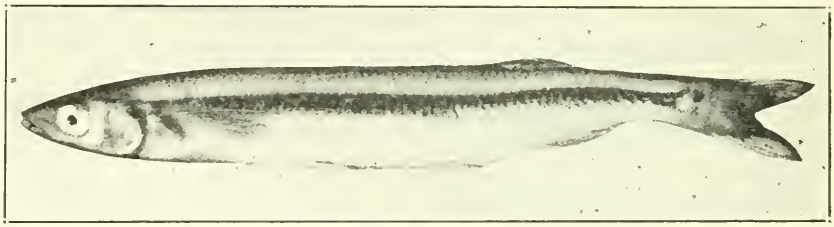

FIG. 30. The grunion, *Leuresthes tenuis*.

the tide fluctuate in two-week as well as daily cycles, series of maximum tides, termed spring tides, occur with the full and dark of the moon (see graph). It is with these maximum, fortnightly tides that the grunion runs are associated. Grunion may be taken in the surf shortly before the turn of the tide, but they do not appear on the beaches until after the tide has begun to recede. The run on any one night lasts about an hour. Popular belief is that the fish appear on the second, third and fourth nights after the full and dark of the moon, but while this holds true roughly, no hard and fast rule can be laid down as to the particular night on which a grunion run can be expected to begin.

The runs occur approximately every two weeks on each series of high tides, but as the season advances, the lag between the night on which the highest tide occurs and that on which a grunion run begins, becomes increasingly greater. Clark (*loc. cit.*) calculated that an approximate fifteen-day interval elapsed between the beginning of any two successive runs. Observations made during 1926 have helped to show that this usually holds true. The accompanying table and graph give the dates on which runs were seen in 1926, and illustrate the relation between spring tides and grunion runs. The first run observed for the

[1] Thompson, Will F., assisted by Julia Bell Thompson. The spawning of the grunion (*Leuresthes tenuis*). Calif. Fish and Game Comm. Fish Bull. No. 3, 1919.

[2] Clark, Frances N. The life-history of *Leuresthes tenuis*, an atherine fish with tide controlled spawning habits. Calif. Fish and Game Comm. Fish Bull. No. 10, 1925.

Dates of Maximum Tides and Dates on Which Grunion Runs Were Observed at Long Beach in 1926.

Dates of highest tides	Dates of observed runs
March 30	March 30
March 31	March 31
April 1	April 1
April 12	April 13
	*April 14**
	April 15
	April 16
April 28	*April 29*
April 29	April 30
	May 1
May 10	*May 14*
May 11	May 15
May 27	*May 29*
May 28	
June 8	
June 9	
June 25	
June 26	
July 7	July 12
July 8	*July 13*

*Dates in italics are the calculated dates for the beginning of a grunion run on the basis of a fifteen-day interval between the beginning of successive runs.

season was on the night of March 30. On a basis of fifteen days between the beginning of any two successive runs, the dates on which subsequent runs were expected to commence have been calculated, and are indicated in the second column of the table by italics. On April 13, a very small run was observed, while according to estimate the run would not have begun until April 14. On April 29, May 14 and May 29, the runs began on the calculated dates. Unfortunately, no observations were made in June. The next run observed was July 12, again one day before the calculated date. While it is not always possible to predict the exact date on which a grunion run will begin, the assumption of an approximate fifteen-day interval between spawnings is reliable in most instances. The table and chart also show that as the season advanced, the discrepancy between the date on which the tide was highest and the date of the beginning of a run of grunion became increasingly greater. In March the fish ran on nights when the tide was at its maximum, in April they averaged one day later, in May approximately two days, and in July four days.

To those who are primarly interested in obtaining a good catch of fish, the above facts are of chief importance. By the use of a reliable tide table, anyone can predict with fair certainty the date and time of appearance of the grunion. For those who are also interested in the maintenance of these runs, further facts are necessary.

That the grunion come up onto the sand in order to spawn, probably occurs to but few of the vast crowd of people who line the beaches waiting for a chance to catch the fish as soon as a wave recedes. The grunion collect in the surf for about an hour before high tide, and when

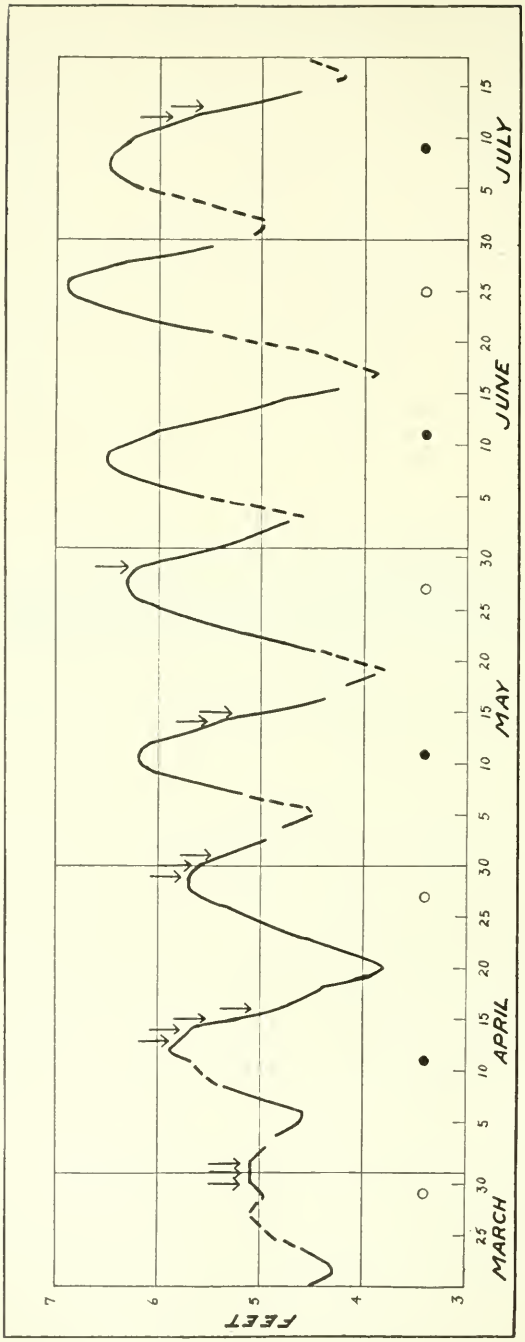

FIG. 31. Highest levels reached by tides each twenty-four hours at San Diego, March-July, 1926. Solid line indicates tides occurring at night, broken line, tides occurring during the day. Nights on which grunion runs were observed at Long Beach indicated by arrows. Tidal data taken from Pacific Coast Tide Tables for 1926, published by the U. S. Coast and Geodetic Survey.

the tide begins to ebb, wash up onto the sand with the highest waves. When a wave recedes, the fish are left on the sand, the female digs into the sand tail foremost and deposits her eggs as the male fertilizes them while lying arched around her. If the fish succeed in eluding capture, they flop back to the water or are washed back by the next wave. The eggs lie buried in the sand for two weeks until the next series of high tides digs them out. At this time the fish hatch and are washed out to sea. The individual fish spawn more than once during a season, returning to spawn on each series of high tides. The fish mature at the end of their first year and spawn for two or three years, but, as far as known, no fish has been found that has completed its fourth year. Most of the fish taken at the present time are spawning for their first season, having just completed their first year.

In 1919, when Thompson made observations on the runs, the grunion were found at Long Beach in great numbers. No difficulty was experienced in obtaining a good catch. Since that time the number of people coming to the beaches has increased tremendously, and the number of fish captured on each spawning run has been augmented in proportion. Observations made by members of the staff of the California State Fisheries Laboratory have indicated a steady decline in the size of the grunion runs at Long Beach until at the present time only a few fish are found where thousands once were seen.

It is not conceivable that any species could withstand the strain to which the grunion has been subjected during the past few years. At the present time, the number of people taking grunion is so great that depletion would undoubtedly have occurred even if each individual had been conscientious and taken only as many fish as he could actually use, and confined himself to picking up the fish on the beach. Unfortunately, people are carried away by the excitement of capturing the fish and go home with many more than can be utilized, with the usual result, the surplus find their way to the garbage can. Grunion fishermen have also discovered the fish can be caught more readily in the surf by the use of nets or screened frames than by the more sporting method of picking the fish up from the beach. That this is illegal, few people realize. The combination of these three factors—the rapid increase in the number of people coming to the beaches, the taking of more fish than can be used by the fishermen, and the illegal capture of the fish by nets, screens and other mechanical devices—has resulted in a dangerous depletion of the stock of grunion. The last two factors can be eliminated by a conscientious effort on the part of the people catching the fish, but this is not true of the first. The number of people coming to the beaches will undoubtedly continue to increase and, if the grunion runs are to continue as a valued attraction, some protective measure must be adopted.

A closed season during the first half of the spawning period is therefore suggested with the hope that it will afford some protection and possibly aid in building up the run. Such a season should extend from March 1 to May 31. This would allow four or five unmolested spawning runs, and fish hatched from these eggs would mature and spawn the following spring. Since the fish spawn more than once during the season, the individuals protected early in the season would return to the beaches during the open season, but would have had opportunity to

spawn at least once or twice before possible capture. The people in their turn would have the pleasure of grunion fishing during June, July and possibly August. From a biological viewpoint, to allow the extermination of the grunion is nothing short of criminal, since this fish is apparently unique in its spawning habits. From an economical standpoint, conservation is equally important. Protection now should mean a continuation of grunion runs, thus assuring recreation and pleasure for people in the future as well as at present. Such conservation measures, however, are possible only through the efforts of every citizen, both in bringing about the passage of protective laws and in loyally supporting these measures after their enactment.

A NEW FISHERY IN MEXICO.*

By J. A. Craig.

Within the last three years an unusual and interesting phase of our fishery relations with Mexico has developed. In 1923 the natives around Point San Felipe, on the northwestern coast of the Gulf of California, started to catch the large croakers, locally called "totuava," for their swim bladders.

This fish is the largest member of the family Sciaenidae and belongs to the subgenus *Cynoscion*. The species is *Cynoscion macdonaldi*. They often reach a weight of 170 pounds and superficially resemble our white sea bass, *Cynoscion nobilis*. At some seasons, especially in the spring, they are very numerous in the shallow water at the mouth of the Colorado River, and even enter the lower portion of the river itself.

The product secured from the swim bladder is called "buche" and is made by simply removing the bladder and as much of the peritoneum as possible, and drying it in the sun. Sometimes as much as three pounds of this dried material is secured from one fish. It is sold at a price of from $1.50 to $2 a pound to the Chinese, who consider it a great delicacy, and use it in chop suey and other dishes.

In this early period of the fishery, a small portion of the fish caught was filleted in large slabs and dried by the simple method of dipping the meat in a strong salt solution and hanging it in the sun to dry. By far the greater portion of the fish, however, was merely thrown away and allowed to decompose. The dried fish was used only locally by the natives. A small part of the catch is still dried and used in this way.

A fishing camp consisting of tents and brush huts sprang up where the fishing was conducted, and is now called San Felipe. It still exists in its first primitive condition with no permanent structures, and in the winter, when the "buche" season is at its height, contains about two hundred fishermen.

In 1924 men with trucks started going down and buying the fish and bringing them back to Calexico, where some were sold locally and the rest iced and trucked to the markets at San Diego. A market was found for the fish at Los Angeles also, and so they were soon being trucked to both places. From Calexico to San Felipe, it is 135 miles over the plains bordering the Colorado River. Most of the road is level

*Contribution No. 60 from the California State Fisheries Laboratory. June, 1926.

but very rough, and in some places it follows the course laid out by the pioneer who first drove his burros down there. Besides the roughness of the route, the road is sometimes covered with overflow water from the Colorado River when it is in flood, with the result that trucks are occasionally marooned until the water goes down. This all makes a long, hard haul for the trucks of about twelve hours or more from San Felipe to Calexico.

At Calexico the fish are iced and transferred to trucks with trailers, each truck with its trailer hauling about three tons of fish. The trucks then take the fish to the markets at Los Angeles or San Diego over paved highways. Most of the fish during 1925 and the spring of 1926 were sold in Los Angeles. The trucks go down and get loads as often as the market can absorb the fish. Most of the "totuava" is filleted and all of it is sold in the fresh fish markets. The flesh is of a fine flavor and firm, with good shipping qualities, but rather coarse.

As soon as a market was secured for the fish, other species were caught for exporting, as the waters adjacent to San Felipe are literally teeming with fish life.

Of the fish secured at San Felipe, the next in importance to the "totuava" is the "corbina," *Cynoscion xanthulus*, a member of the same family and subgenus. It is a much smaller fish than the "totuava," weighing from two to five pounds on the average. Like the "totuava," it is an excellent fish for shipping and has a fine flavor, and flesh of a much more delicate texture. These are the only two fish shipped in any quantities to Los Angeles.

Several other small fish are brought up to Calexico and sold to local trade, and at times a few are sent to San Diego. Mullet of fine size and quality are very abundant at San Felipe, as are also pompano and a fish locally called "cabrilla." One specimen of the latter identified was *Paralabrax maculatofasciatus*, but in all probability the fishermen and dealers also include under this name some larger and related species such as *Mycteroperca jordani*.

Mexican sierra, *Scomberomorus sierra*, are very plentiful and easily taken. They are beautiful fish, almost identical with the Spanish mackerel of the east coast, and are a most excellent food fish, but do not stand shipping as well as the "totuava" and "corbina," so consequently have not been used except locally about Calexico.

During the spring months there are numbers of large sea turtles caught at San Felipe. Most of them are harpooned, although a few are taken alive and shipped out to Los Angeles or San Diego. These turtles are very rich in fat and the principal object of their capture is to secure this oil. The turtles are cut up and the flesh and fat placed in large pans filled with water. The fat is then boiled out and allowed to separate from the water. After being cooled, it has about the consistency of soft lard, and is light yellow in color. It is packed in five-gallon oil cans and sold for a good price to druggists. The turtle meat remaining is salted and dried in the sun and used for food.

Prawns can be taken in large quantities and there are practically virgin beds of hard shell cockles, *Chione fructifraga*, or a closely allied species, near San Felipe.

The methods of catching the "corbina" and "totuava" are exceedingly simple and primitive. The fishermen fish from skiffs, there being but two or three motor boats at San Felipe and these are seldom used.

The tackle consists of a very stout line with a single large hook. For bait they use a small dead "corbina" or a piece of any other fish that is easily secured. The fish are so plentiful that they bite freely on this rough gear even when it is very poorly baited with fragments of flesh or skin of a fish. When a fish is secured it is hauled in by main strength and dispatched as quickly as possible.

During the 1925–1926 season, there were at San Felipe three Japanese who owned a round haul net. They did not take many "totuava" with this gear because of the size of the fish and the fact that they often got too many in one haul to get ashore or to use. Besides the fish are so easy to capture with hand lines that it does not pay to use a net.

There is one Mexican fisherman with a small round haul net who

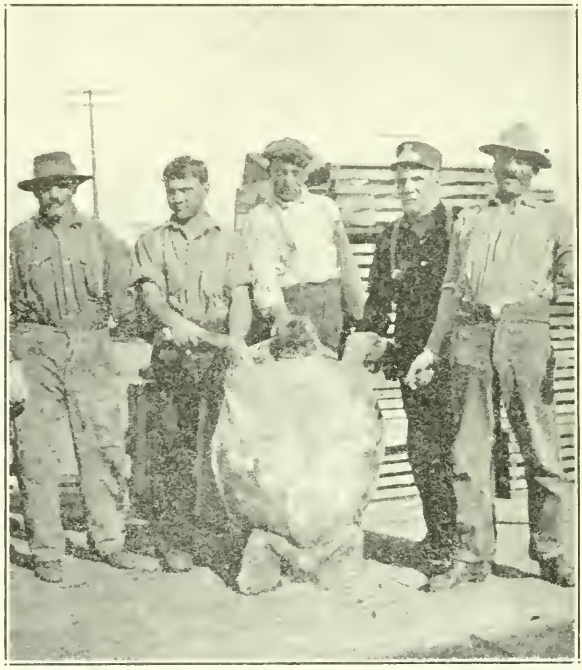

FIG. 32. Mexican turtle just landed from coaster at San Diego. Photograph by E. Schaeffle.

keeps the Calexico market supplied with the smaller fish such as mullet, pompano and "cabrilla." The sierra can be taken either in the net or with hook and line.

The season for shipping fish out usually begins in October and lasts all through the winter and sometimes until April. The "buche" season is roughly of the same duration, as there is a closed season on the "totuava" from April 1 to October 1. During the summer months and the closed season, San Felipe is practically deserted, since there is no permanent town or anything to keep the fishermen there when no fishing operations are being conducted. Practically all of the fishermen are Mexicans or Indians. A few, however, are Japanese.

In spite of the trucking out of quantities of fish, there are still many fish left to rot after their swim bladders have been removed, as the primary object of the fishery is still the manufacture of "buche."

The waters adjacent to San Felipe would indeed be the location of a fine fishery if it were not so isolated from suitable markets, and if it had adequate routes of communication with some large centers of population. Also it would be a paradise for sportsmen, for who would not go many miles to battle, with light tackle, a 170-pound "totuava" or a leaping sierra?

NO MORE WASTE LAND.*

By A. Rutledge.

A sign of that nature I had never seen before, and there was something so whimsical about it that it seemed the work of a humorist instead of the sage plea of a state game commission. Paraphrased roughly, it read something like this:

"Mr. Farmer, don't keep your place too clean. Leave that forlorn patch of scrub growing over yonder by the creek; leave that briered fence row; leave that bushy ditch bank just as it is. Your best friend of the great bird kingdom, bobwhite, can't live with you if you take away all his cover. Keep most fields clean, if you like, but leave some places deliberately disheveled for the sake of those who will leave you if you clean away their shelters. . . ."

This was a pertinent and a sensible request, put in a far more persuasive way than a cold announcement could have been put. And it serves to introduce a much wider subject, and one full of fascination for lovers of the outdoors and the creatures that, for all our proud so-called advancing civilization, remain distinctly Nature's children. Moreover, because of that very advance in man's civilization, the question is a vital one. It is this: What is the relation between our conquest of the earth and the fate to which that conquest may subject the creatures of the wild? Does the civilization of man mean the extinction of the beast? Well, it easily might.

Wild Life Back to the Land.

But there are two great saving elements in this difficult and dangerous situation. The first is that man stays his hand and opens his heart. He protects; he provides sanctuaries. Recognizing the beauty, the companionship, the economic value of wild life, he forgoes the pleasure of killing for the saner pleasure of keeping alive. The second saving factor is this: Wild creatures are singularly humble in their demands. They will take what we reject. They will occupy what we abandon. They will rejoice to inhabit our waste lands and our wildernesses. There is no place so apparently impossible for the habitation of man but can be

*We have seen no better presentation of the outstanding need for that necessity of every living species—food and cover—than that contained in the above article published in the Saturday Evening Post of July 31, 1926. It is reprinted by special permission from the Saturday Evening Post, copyright 1926 by the Curtis Publishing Company. It will stand a second reading by those who have already seen it as originally published.—Editor.

made into a home for wild creatures. It looks therefore as if, as civilization advances, man will acquire and keep all the choice localities; and at first by chance, and then deliberately, with mercy premeditated, he will apportion the waste lands to the wild children of the woods and the waters and the air.

For a great number of years I have been interested in the matter in question, and have been engaged from time to time in projects of restocking game preserves. If I can tell a few stories relative to this subject, I shall perhaps be most simply accomplishing my object—which is to show that, whether a man owns ten acres or ten thousand, it is wise and just and economic to quarter a portion of his holdings to the ancient inhabitants of the land, that will be glad enough to use whatever is unsuitable for purposes of man. Strictly, there is no such thing nowadays as waste land. A marsh becomes a mink and a muskrat home; an old rice field becomes a duck preserve; the junglelike growth that follows the felling of big timber becomes a sanctuary for deer and for ruffed grouse; the spouty patch in the cornfield's edge that can never be cultivated will grow cat-tails and witch grass and big briers that will protect the quail when the hunters and the red-tailed hawks are on the scene.

During the hunting season of 1925 I frequently went to a valley in southern Pennsylvania which well illustrates the principle that whatever man deserts Nature reclaims. In this valley, some eighteen miles long and two miles wide, almost every foot, clear up to where the mountain benches begin, used to be under cultivation. But one after one the hillside farms and the creek-bottom pastures have been deserted. People have moved to the nearby towns. In the whole valley now there are not more than eight or ten homes. And Nature, in her quiet, joyous way, has retaken what, centuries ago, in frontier days, was bitterly wrested from her and from the Indians.

As I roamed the deserted valley and the slopes above it I was curiously interested in the manner in which wild things were taking part in the recapture of their ancient home. Here in a deserted orchard, where a few gnarled apple trees still were bearing, deer had been munching the fallen fruit. In this old upland field where some volunteer buckwheat had sprung up, wild turkeys had been foraging. Beside a pathway leading from a collapsed mountain home to its inevitable spring I flushed two ruffed grouse. In the shellbark trees along the creek—trees that the farm boys used to raid for nuts—gray squirrels were gathering their winter supply of food. In the creek itself, where tame ducks were wont to go vacuum-cleaning, I flushed a score of migrating mallards.

Man comes, it seems, as a destroyer, but no sooner is his power relaxed than the timid legitimate dwellers in the land return to reclaim what they had been obliged to leave. All they seem to want is a bare chance. They can not occupy and increase in the face of high-power rifles, traps and shotguns; neither could man. But they are swift and valiant to return when the chance of getting killed is even slightly diminished.

My experience in this wild appealing valley, and experiences elsewhere of a similar nature, have led me to believe that there should be no such thing as waste land. Whatever situations man is too proud or lazy to occupy, wild creatures will humbly rejoice in.

Some places, indeed, are the better for game after man's invasion.

For example, the holder of a huge tract of yellow pine in the south told me this:

"Formerly," he said, "when all the big timber was standing, we had not a great many deer on the place. I think the woods were too open; practically the only cover was the broom grass. But eight years ago we cut about a thousand acres of pine. On that land a regular jungle grew up—myrtle, bays, huckleberries, gall berries, sparkleberries, and other brush of many kinds, much of it overrun with smilax and jasmine vines. As a result, there was ideal cover and to it the deer thronged. However, I noticed that the wild turkeys kept to the big timber. They do not like thickets, for in such places the wildcat and the fox have the best chance to operate against them. Deer will come to cut-over land, but turkeys will leave it until the second growth is fairly well developed."

It frequently happens that a situation that is attractive to wild life can be made positively irresistible merely by a little intelligent adjustment by the owner of the land.

I shall never forget with what amazement I looked upon a duck preserve near Oakley, South Carolina, some thirty miles up the Cooper River. Adjacent to the river were waste rice fields, long since abandoned, over which the tides of a generation had ebbed and flowed. Despite, however, these periodic inundations the general layout of the fields remained unchanged. There were the remnants of the ancient banks, the integrity of which had been partly maintained by the trees and bushes growing along them; there were the ditches and canals, in many cases widened and deepened by the dredging of the tides: there were the expanses of the fields, now grown to marsh and duck oats instead of to rice.

Such landscapes have been familiar to me since boyhood, but I was not prepared for the gorgeous spectacle of the wild life that thronged these fields. Mallards, green-winged and blue-winged teal, pintails, widgeons, wood ducks, a few canvasbacks, and black ducks, in thousands, were joyously feasting, preening themselves, tipping up in the warm shallow water, hailing all passing flocks with the glad tidings that the true paradise for wild fowl had at last been discovered. As I walked down a green bank, to the top of which the limpid water almost brimmed, I flushed a vast concourse. The whole field seemed to rise, yet as quickly settled back again. Many of the ducks flew so lazily and contentedly that I noticed they they hardly drew up their feet under them. In these days of myriads of hunters and the last word in firearms I was frankly amazed to see such a sight, and asked the owner of the place, who was with me, to account for the wild-life vision that I was seeing.

The Formula for Wild Ducks.

"Three things have done it," he said. "These fields, you see, were worthless to me for planting purposes. But ducks have always come here. I decided first to post it carefully. Then, at a small outlay, I mended the banks and the trunks so that the fields can be made to hold water when once the water has flowed on them. A duck isn't going to light on dry land—not if there's water within reach of his wings. The third thing was the matter of feed. At some clubs rice and corn are fed regularly, but I can't afford to give them the things that keep me alive.

I went up to Washington and spent two or three days at the Department of Agriculture finding out just what wild food would grow here—things that the ducks like best. I had recommended to me duck oats, water lilies—you know that the ducks eat the little potatolike nodules on the roots—and the American lotus. This last is probably the most successful food I have tried. The bloom is like a big mallow, held high above the water; then a seed-holding disk is formed, in a general way like a sunflower; then the seeds come, like hard black acorns. And the ducks are crazy about them. Of course these seeds are shed into the mud when frost comes, and the ducks dive and forage for them.

Yes, these old fields were worthless, but in these days there is no such thing as waste land if a man will turn over to wild things those parts of his property which he can't use himself. And if he will encourage the wild life just a little he will have it coming in abundance. There are fields, just below me here on the river, of the very same character as mine, and they have comparatively few ducks visiting them. Reasonable quiet and protection, water, food—get those three conditions in this part of the country and you will have all the ducks you want."

This setting aside of sanctuaries, whether done as a private enterprise in conservation or whether done designedly by a state as a public duty, always has the same effect—the immediate and gratifying increase in wild life. But the effect is much more far-reaching than might be imagined. I know huge tracts of wild country, in Pennsylvania, in Virginia, in Maryland and in the Carolinas, which ten years ago were practically dead as far as game birds and animals are concerned. Now they are alive again, and the magic of this resurrection has been accomplished solely by the system of public sanctuaries or by the big preserves of private clubs.

Fortunately, game does not appear to distinguish between public and private preserves and sanctuaries; it will come to one as quickly as to another, and will also leave. The deer and the turkeys and the grouse that wander from the protected areas slowly repopulate the desolate hinterlands, and they also afford the humble average hunter with a little sport and with no end of exercise full of exciting promise. I know of a hunting club which, ostensibly organized to kill game, has yet been the greatest game preserver of the region where it exists.

On the southern coast the club has an ownership of perhaps sixty thousand acres. The place is unfenced; and though it is rigorously protected, no attempt is made to segregate the game within its ample borders. As a result, particularly in the summer when the cover is dense and when the woods are free from hunters, deer and turkeys in great numbers wander far beyond the boundaries of the club lands. The hinterlands, which had been combed of all their game, are once more replenished. The natives, who at first resented the coming of the great club and its exclusive ways, have now learned that a wild turkey for Christmas or for Thanksgiving and a pretty plentiful supply of venison all through the winter are due directly to the club's existence.

Gun Clubs as Game Protectors.

A fraternal feeling has come to prevail between the members of the club and their less fortunate neighbors; and it is a feeling which, rightly understood, is a promise of a new day in American sportsmanship. It is the feeling born of the conviction that game protection by

one man or one organization is game increase for other men and other organizations. This club did a rather unique thing for the sake of game preservation, and a sensible thing it was, too. On a deserted plantation that was bought to be added to the club preserve were some eight or ten negro families who were occupying the old slave quarters in the very heart of the deer country of the plantation. The club bought up some good property in a neighboring negro settlement safely outside the preserve, built there the required number of simple homes and moved the negroes there. They were only too glad to go, for the negro who is not gregarious does not exist.

Some twenty miles west of Gettysburg, on the Lincoln Highway, there is an inn. Within sight of the windows of the inn are the borders of a virgin forest fastness—one of the great game sanctuaries that the state of Pennsylvania has set aside for the use of wild creatures, and indirectly, of course, for the benefit of the hunters of the state. From that beautiful forest one can see trooping, especially in the late afternoon, small herds of whitetail deer, perhaps the most widely distributed of all American big-game animals and, in a way, the most characteristic wild creature of our country. It is heartening, in these days of swift transportation and deadly guns and rifles, while one is at dinner within a stone's throw of the Lincoln Highway, down which heavy traffic roars all the day long, to see genuinely wild creatures timidly stealing out of their coverts to nibble at a farmer's wheat or to browse on the tender green of his choice apple trees. The emotion with which I view such a sight is probably radically different from the farmer's.

Nevertheless, the presence of deer in a civilized community represents a definite triumph. Nor are these creatures pets. They are the real thing.

I remember seeing a huge old stag, the hero of many a thrilling escape on the nearby mountains, calmly munching apples within rifle shot of the hotel! Many of these deer—particularly the old bucks—seem to know quite well when the hunting season begins, and at that time they manifest a decided partiality for the sanctuary itself. Game recognizes a protected area; and though there is some straying and straggling, the sanctuary idea is wholly effective. It is not a bad thing for the sanctuary, for the adjoining orchardists and for the herds themselves for some deer to be killed each season.

Some twenty-five miles southwest of that inn is the Orquic Valley Sanctuary, a place in which I have spent much time. It is in much wilder country, though a good road runs through it. I knew it years ago, long before the state set it apart as a preserve. Then it was anybody's land, overrun by hunters, often burned out—a desolate wilderness. Now it is beautiful with heavy timber, with a lush undergrowth, musical with a fine trout stream roaring through its dewy coverts, protected from all marauders.

For several years, by some calculations which I believe to be accurate, I have ascertained that, but for this sanctuary, all the deer and turkeys of that region of the Tuscaroras would have disappeared. They have increased; and the increase, indeed the survival, the sanctuary made possible. On its borders now, every season, hunters have genuine sport; and if what escapes them gets into the preserve they feel that it is just as well. I think that there is a growing sentiment among

all hunters that all game should have at least one inviolate place into which it can not be pursued. A game sanctuary is not only a temporary life preserver, it is a guaranty of the survival of a race.

By all odds the most interesting game sanctuary I know is Bull's Island, one of the barrier group of the Carolina seaboard. Separated from the mainland by many deep salt waterways that wind through a vast sea marsh, it is effectively isolated. Nine miles long, three miles wide at its widest point, heavily wooded, rich in semitropical jungles, and having an abundant supply of fresh water, it is most fortunately appointed by Nature as a home for wild life. I believe that there is more game on this island than there is on any area of similar size in America, perhaps in the world; and its presence there is to be accounted for by methods of intelligent protection and sensible encouragement.

I remember walking one afternoon down through the lustrous thickets of this magic isle, and hardly for a moment was wild life out of sight or sound. I saw five flocks of wild turkeys—there are no foxes on the island—raccoons pacing sedately down the dim pathways aglow with the ruby lights of sunset, flocks of wild ducks speeding toward the reedy flows, and perhaps fifty deer. At one time I had twenty-six in sight, coming out of their daytime coverts to browse on the marsh edges and to roam securely the solitary country of the night. I walked up close to a stag that stood motionless in reeds as tall as his back. His massive neck and his regal head were all of him that showed. As I got too near he crouched slightly, hoping, I think, to be passed by; but then he changed his mind and went bounding off, his great flag erect and jerking from side to side.

Usually, after a day of travel through the wilds a man will have one or two vivid scenes of wild life to recall. On Bull's Island such scenes are bewildering in their number and variety.

Sane Control a Necessity.

Yet twenty years ago there were no turkeys on this preserve. There were few deer. The duck ponds were grown shut with choking aquatic plants. But a little ditching and draining deepened the ponds, so that now, on a midwinter's morning, mallards and black ducks pour into the idyllic lagoons that lie shielded by the virgin pine forests. Protection was all that the deer needed. I suppose there is no animal in the world that, considering its size and importance, responds more certainly to man's encouragement than does the whitetail deer. A barren doe is a rarity, and a great many have twin fawns.

Experts in permutations and combinations have estimated that a buck and a doe will, through their offspring, in fifty years produce thousands of descendants; and this will happen if the hand of man against them is stayed.

There are so many deer on this island now, and so frequent and fierce are the encounters of the bucks in the mating season, that it is necessary to kill off a certain number of stags every year. The oldest are killed so that the vigor of those in their prime will establish the stamina of the succeeding herds.

The case of the wild turkey is different and it is, I think, an interesting story. The owner of the island brought from the adjacent mainland

three wild-turkey eggs, and these were hatched under a hen and raised by her. Fortunately there were one gobbler and two hens. From such a start have come the splendid flocks now on the island. In this connection I do not see why it would not be possible to repopulate with wild turkeys many of those areas which in colonial days had an abundance of these magnificent birds. They have been brought back to Pennsylvania; in some regions in almost incredible numbers—I lay on my ground behind an old chestnut log last autumn in the mountains of Franklin County and carefully counted a flock of forty-three of these great birds. The Adirondacks should have as many turkeys as deer, and intelligent stocking would bring them back. It is not, of course, necessary to start with purely wild stock. A wild gobbler turned loose with six bronze hens will soon populate a wild tract with America's supreme game bird. Not long ago I was talking with an old mountaineer who complained that every spring his turkey hens wandered off into the hills where the wild gobblers were; and it is a common experience of turkey hunters to kill birds that have markings that unmistakably indicate their relationship to the tame variety.

I have spoken of Bull's Island as an extraordinary sanctuary for wild life; yet, for all its languorous beauty and exotic charm, it is not a good place for human habitation, except perhaps for a few winter months. In the old days it was pirate haunted, and now it has all the drawbacks of a tropical isle. In the sense that it is not a place where men would gladly live it is waste land, yet a veritable paradise for wild life it has become. Practically the same thing holds true for many of the great sanctuaries set aside on the Gulf Coast, the principle of the whole thing apparently being this: Whatever is rejected by man is, or may become, acceptable to wild things.

The earth was anciently theirs; they were here, it seems, before man; and they may survive when he is gone. They are in many ways better equipped for the adventure of living than men are. I sometimes think they are more gallant. Certainly they surpass us in the keenness of every one of their senses. Yet their fate is in our hands.

The idea of always associating the forward march of man with the destruction of all lesser forms of life appears to be giving way now to the saner and kindlier idea of preservation. Absurdly simple is the requirement for having beautiful wild life on your place: Don't kill it and don't clean away with Dutch immaculacy every vestige of that wild home that Nature provides. These wild things live humbly, drawing sustenance from Nature's own ample bosom. We must not rob them of their homes.

Let us have no more waste lands, but turn these, great and small, into sanctuaries for our wild things of woods and waters, fields and sky.

LIFE HISTORY AND HABITS OF THE WESTERN MOURNING DOVE.

By Harold C. Bryant.

Among the game birds of California there is scarcely one so well known as the western mourning dove. It is distinctly a bird of the open country. During the summer season it is found throughout the

FIG. 33. The mourning dove. Courtesy National Association of Audubon Societies.

lowlands of the state, and a few birds are known to inhabit the pine belt of mountain slopes. The low, rolling foothills of the Sierra attract a vast number of these birds, and nowhere are they more abundant. In the vicinity of Folsom, Snelling and Chinese Camp the dove is the bird most frequently seen from the homestead or the highway. In the winter doves are scarcer, and in certain localities they may disappear entirely. They migrate south to warmer climes, and spend the winter along the coast of Mexico and Southern California, below the latitude of Santa Barbara, and on the adjacent islands. A few winter in the Sacramento and San Joaquin valleys. The bulk of the evidence indicates that this migration occurs in September, but a few birds linger until late in October.

About the first week in May the mourning dove returns to central California. At least observers report that doves become noticeably more abundant at this time. During spring and summer, mourning doves are nearly always found in pairs, but later on in the fall young birds as well as old congregate in flocks. Among all birds there are few that are so constantly seen in pairs. A scattered flock of doves will invariably resolve itself into pairs of birds.

There is little danger that any one will need to depend upon a written description of the mourning dove in order to make its acquaintance; but for the benefit of the few who are unfamiliar with it a brief description will not be out of place. The mourning dove is pigeon-like in most respects, except for its smaller size and long pointed tail, which is margined with white. The general tone of coloration is olive brown. The rapid whistling flight and the mournful coo of the male can more often be depended upon to identify this bird than a close view of its form and coloration.

The mourning dove has one of the longest breeding seasons of any native bird. Definite records are at hand that prove beyond a doubt that it nests as early as February and as late as the first part of December. The height of the nesting season covers the months of March to September. A minimum of two broods is reared, and in all probability three or four nestings are not uncommon. The nest is occasionally placed on the ground, but more often on a limb of a shrub or tree, from four to eight feet above the ground. Cases are known, however, where nests have been built at a height of forty feet. The nest itself is a crude structure, built of small sticks laid loosely together. In it two glossy white eggs are laid. The young are fed on "pigeon milk," by a process technically known as regurgitation. They grow rapidly and are soon ready for flight. Soon they are foraging widely for weedseeds, and taking daily flights with the adults to water.

The female mourning dove shows the greatest solicitude for her home. She is the most adept of birds at the ruse of the broken wing. When her nest is menaced she limps and flutters along the ground until the intruder is convinced that the bird is so badly injured that she may readily be caught. The deception is apparent only when the intruder finds himself led well away from the nest, and the bird takes flight in a normal manner. This habit appears to be largely limited to ground nesting species, and it is otherwise unusual to see a bird come flutter-

ing to the ground from a nest above. This particular instance is worthy of further study. Why this clever trick should be so markedly developed in some birds and entirely lacking in others has long puzzled scientists.

The coo of the male is a common sound early in the morning during the nesting season. Although made up of a succession of beautiful soft tones, yet the ensemble is so mournful that many people are disturbed by it.

Doves are dependent upon a good supply of water, and in the course of a day they will make several trips of many miles to drink. Because of this habit and because these birds fly out to the open fields for food there is usually a distinct "fly line" just at dusk when the birds are returning from feeding and watering. This gives the dove hunter an opportunity for wing shooting, and in southern California this sport is especially popular. During the open season certain foothill districts in Los Angeles County are so populated with hunters that unhampered open places are difficult to find. The gunner who desires to test his marksmanship on doves is assured of a savory reward if he proves his skill, for the young birds are tender and delicious.

Unless favorably located near a watering place, one bird in three or four shots makes a good average for all but the most experienced hunter. The small size and great speed make the bird a difficult target. The variety of shots possible is almost endless. Quartering and side shots are most difficult because of the speed of the birds in flight. Then come shots at towering or descending birds, often dependent on whether they are coming or going. The easier straight-away shots are to be expected less often in dove shooting than in quail shooting.

Thus it will be seen that dove hunting gives the best of practice to the lover of wing shooting. No finer test of skill is afforded unless it be in snipe shooting.

In defence of this sport the hunter rightly argues that doves are abundant, very prolific and capable of rapid recuperation; that rapid flight and a quick response to danger sufficiently protect them. Despite this argument there has been a growing sentiment of late that this bird should be taken from the list of game birds and protected throughout the year. Although of excellent flavor, the mourning dove can hardly be considered a desirable game bird because of its small size. When its esthetic value and its service to the agriculturist is taken into consideration the plea for total protection is justified.

Apart from man the dove has other enemies. The duck hawk is swift enough to overtake the dove, and this bird is probably the dove's most dreaded avain foe. Other predatory species take a toll during the nesting season. Its rapid flight frequently brings the dove in violent contact with telephone wires, and many birds die annually from this cause. Rodent poisoning operations have in recent years been responsible for the death of many doves; for, unlike the quail, the mourning dove and the band-tailed pigeon are both susceptible to strychnine, and, although the loss from this cause may not be great, it is unfortunate that it exists at all.

The mourning dove is to be numbered among those birds against which practically no complaint is made regarding depredations upon

crops. The small amount of grain taken in California is negligible and is so considered by ranchers. On the other hand, its value as a destroyer of the seeds of noxious weeds is unequaled by any other bird in the state.

Some idea of the enormous quantities of weed seeds consumed by doves can be obtained from the results of the examination of a dove's stomach and crop made by the United States Biological Survey:

	Seeds
Slender paspalum (*Paspalum setaceum*)	2,000
Orange hawkweed (*Hieracium auranticum*)	4,820
Hoary vervain (*Verbena stricta*)	950
Carolina cranesbill (*Geranium carolinianum*)	120
Yellow wood sorrell (*Oxalis stricta*)	50
Panic grass (*Panicum* sp.)	620
Other weeds of various kinds	40
Total	8,600

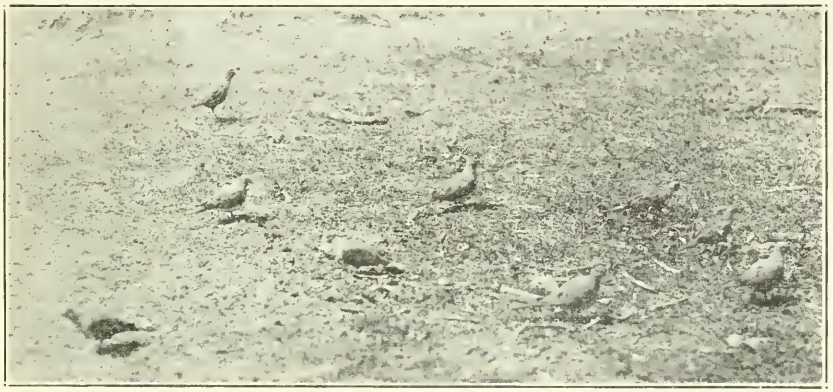

Fig. 34. Captive mourning doves foraging at the old Hayward Game Farm. Photograph by H. C. Bryant.

The examination of the crops and stomachs of doves taken in California has substantiated this evidence. The crop, and even the gullet, has been found filled to its utmost capacity with weed seeds. The stomach and crop of a dove taken at Lakeside, San Diego County, contained more than 100 seeds of the coyote vine or mock orange (*Cucurbita foetidissima*). Hundreds of seeds of filaree, mustard, turkey mullein and tumble weed have been taken from other stomachs. Examinations of nestling birds have shown that they are fed entirely on weed seeds. Since the seeds destroyed are those of some of the worst weed pests in the state, and since they are destroyed in such very large numbers, the western mourning dove must be considered a valuable bird from the economic standpoint.

The mourning dove makes a satisfactory aviary bird. Mr. L. W. Hammond of Fillmore, California, breeding from a single pair of doves, had a flock of over forty in the space of three years. Each female nested twice and reared two young each time. The nesting season of these captive birds began in March and continued through August. Aviculturists throughout the state have found the bird easily tamed and very prolific.

The game laws regarding open seasons on doves have been severely criticised, and correctly so, for they have allowed the killing of these

birds during the nesting season. Mourning doves often nest as late as September, and an open season beginning before the fifteenth of this month is to be deprecated, for it allows the killing of nesting birds. A list of sixty-six nesting records given in "The Game Birds of California" (Grinnell, Bryant and Storer, 1918, University Press, Berkeley) shows that nests have been found in every month of the year with the exception of October, November and January, and additional data would probably show records for these months also. The earliest record is for February 9, and the latest for December 5, both from Los Angeles County. The height of the nesting season is shown to be in June and July.

In the case of no other game bird in California has the general conservation principle of safety during the breeding season been so continuously violated. For many years, beginning in 1880, the dove season opened on July 1 and closed on January 1, an open season of six months. Since that time many changes have been made, but in deference to the sportsmen, who claimed that the doves leave the great valleys before September 1, the opening date was invariably set back to July 1. Even as late as 1907 the season opened on July 15. Since 1911 the dove season has opened on September 1. A reduction to three months and then to one month in northern California, and to two months in southern California has had beneficial results.

Owing partially to the popularity of dove hunting and also to the destruction of the birds during their nesting season, the dove is becoming much less numerous in many parts of the state. In many places where thousands were to be found ten or twenty years ago, the birds appearing each summer are now to be numbered in tens. This observation should be instrumental in bringing about laws which will give the proper protection to this bird. Judging from the sentiment in favor of giving the dove complete protection as a valuable friend of the agriculturist—a sentiment which is strong even among sportsmen—California may eventually take a stand with eastern states, and see that the dove is entirely protected. We take every precaution to prevent the loss of our personal possessions, but take little heed how we are robbed of the natural resources that we inherit jointly with our fellows. California may well show her appreciation of faithful service rendered, by better protecting her most valuable weed-seed destroyer, the mourning dove.

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CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

November 23, 1926.

"Bringing an appreciation of the importance of conservation to the background of human consciousness is a work which can not be done by one man or one organization in one year, or by many men and many organizations in many years."

NEW MOTION PICTURE FILMS OBTAINED.

Purchase of motion picture film from two well known photographers of wild life, Donald Dickey and E. S. Cheney, together with additional film secured by the Bureau of Education and Research, has made possible some new reels with the following titles:

CALIFORNIA SONG BIRDS: Their home life. (Western Mockingbird, California Bush-tit, Western House Wren, Plain Titmouse, Russet-backed Thrush and Black-crowned Night Heron, Anna Hummingbird, Steller Jay.)

BIRDS OF PREY: Common hawks and owls. (Bald Eagle, Golden Eagle, Pacific Horned Owl, Turkey Buzzard.)

GAME MAMMALS OF CALIFORNIA (Mule Deer, Black-tailed Deer, Valley Elk, Black Bear).

UPLAND GAME BIRDS (Sierra Grouse, Band-tailed Pigeon, A Valley Quail Hunt).

CALIFORNIA WILD-FOWL (Ducks and Geese in Flight, Whistling Swan, Mallard, Coot, Ducks on Lake Merritt Game Refuge).

The above films have been assembled and titled and are now available. These films are loaned without charge to responsible organizations. A regular booking loan system is maintained. It is desirable whenever possible to arrange for several showings in the same general locality to justify the express charges. Many deputies have made arrangements with local theaters for the showing of the commission's educational films and have arranged a circuit so that the films are shown on several successive days in various nearby cities. In displaying these films at schools it is particularly desirable to have a lecture accompany them. A lecturer will be furnished when a number of showings are to be made in the same vicinity, but it is expected that a suitable hall, lantern and competent operator will be provided.

STATE GAME FARM DEDICATED.

A formal dedication of the Yountville Game Farm took place on Sunday, August 22. The principal speaker of the day was Senator Herbert Slater, member and former chairman of the Fish and Game Committee of the State Senate, who appeared as the personal representative of Governor Friend Wm. Richardson. The acceptance was made by District Attorney Thomas C. Anglim of Napa County, an ardent sportsman and leading member of the Napa Sportsmen's Club. Dr. Robert Crees, president of the Napa Sportsmen's Club, presided. Superintendent August Bade pointed out that from the standpoint of soil, drainage and climate the game farm is wisely located. Other speakers on the program were: Hon. Frank L. Coombs, assemblyman from Napa County; Hon. Robert McPherson, assemblyman from Solano County; B. D. Marx Greene, executive officer California Fish and Game Commission, and Major Rolin G. Watkins, publicity director. A large crowd attended the ceremonies and it was afterwards shown about the game farm. All expressed their appreciation of the splendid progress and achievements at the farm.

YOSEMITE FISH HATCHERY DEDICATED.

August 1 was an important day in Yosemite National Park, for in addition to the celebration connected with the opening of the new state year-around highway, there were three dedication ceremonies. Of outstanding interest was the dedication of the Yosemite Hatchery. A large crowd gathered at the site near Happy Isles at 9.30 in the morning. Acting superintendent of Yosemite National Park presided. The first speaker was the Hon. Stephen T. Mather, director of the National Park Service, who spoke feelingly of the long years of endeavor in getting a hatchery for Yosemite and the splendid cooperation now existing between California and federal departments. The second speaker was Dr. Harold C. Bryant,

representative of the Fish and Game Commission, who spoke briefly on the subject, "Past and Present in Fishculture," describing the growth of fishcultural work and emphasizing the present policy of many local hatcheries. The last speaker of the day was Governor Friend Wm. Richardson, who described the reorganization of the Fish and Game Commission on the present efficient basis. In conclusion, he mentioned the importance of state and national cooperation and the friendly relations now existing. His suggested need for better financial support of conservation activities drew a hearty response from the audience.

violators. Every party searched treated them with courtesy save in one instance, where the party was composed of a policeman, a deputy sheriff and a dollar-a-year warden. Strange to say, these were the men who were impertinent and it was the volunteer guardian of California's wild life who asserted he needed no license to hunt. As soon as the matter was reported to the commission, this warden was promptly discharged and court procedure may be instituted against him.

LICENSE NUMBERS OF GAME VIOLATORS' CARS NEEDED.

A number of noteworthy cases have

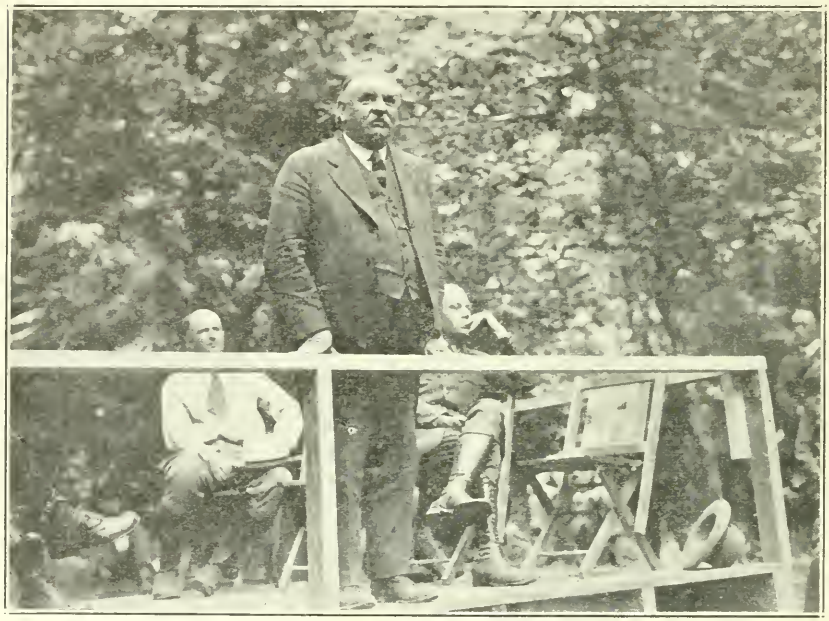

FIG. 35. Governor Friend Wm. Richardson speaking at the dedication of the Yosemite Hatchery. Lloyd photograph.

WARDENS HAVE NO SPECIAL PRIVILEGES.

No complimentary hunting licenses are issued in the State of California. Neither the Governor of the state nor the Fish and Game Commissioners receive complimentary hunting or fishing licenses. It was surprising, therefore, that one of the new dollar-a-year wardens, sponsored by a midland county sportsmen's club, was found with a hunting party on the opening day of the deer season without a license. A group of dollar-a-year wardens from the bay district working with Deputy C. L. Bundock were after law

recently been made by deputies as a result of knowledge as to the license number of the automobile. Sometimes the most helpful thing an interested person can do is to secure several witnesses to a violation and then note the automobile license number. When evidence of this kind is reported to a deputy, he can proceed swiftly to the prosecution of the law violator.

ALKALI POISONING OF DUCKS.

As happened so often in dry years, large numbers of ducks died in various parts of the state last fall. This death of

ducks is not an entirely new thing, for evidence of it was reported from the region surrounding the Great Salt Lake at least twenty-five years ago. Serious inroads of the disease in 1910 brought about an investigation and in 1914 an explanation of the cause of the disease was given. In spite of additional knowledge as to causes and effect, no feasible remedy has been suggested. When the sick birds can be gathered and placed upon fresh water, they usually recover; likewise, when heavy rains come, the disease suddenly disappears. On the other hand, early rains which fill up dried alkali ponds and make attractive feeding places for wild fowl, usually cause an outbreak of the disease.

During early August reports of ducks dying at Tule Lake, in Modoc County, were brought to the attention of the Fish and Game Commission. Messrs. Roy Ludlum and Robert Irvine were immediately dispatched to investigate. As Mr. Ludlum is conversant with former outbreaks and Mr. Irvine is a chemist, they made a good team. The area was covered thoroughly for several days and a careful study of conditions made. Only a few ducks were found dead, and these were secured for post mortem examination. Several sick birds were brought back and used experimentally. No evidence of other disease has been secured as yet and apparently the cause of death was to be attributed, as in the past, to what has been called alkali poisoning.

DUCK DISEASE TO BE STUDIED.

Full facilities of the George William Hooper Foundation for Medical Research, together with the use of its auxiliary department for the study of game diseases which may occur, has been proffered the California Fish and Game Commission by Dr. K. F. Meyer, in charge of the foundation work in San Francisco.

Help is to be given in the study of the duck disease which appears so often around alkali lakes in California. Specimens recently obtained at Tule Lake are in the hands of experts of the foundation and bacterial and other tests are being made, looking toward better knowledge of means of control. Plans are also being made to utilize the same facilities in the study of deer diseases.

As one of the foremost students of the diseases of animals, both wild and domesticated, Dr. Meyer brings to investigations now under way facilities which would be wholly out of reach of the commission under ordinary circumstances.

STATE FAIR EXHIBIT.

The exhibit made by the Fish and Game Commission at the State Fair last September was divided into two sections. Near the main entrance a number of pens were erected and here there were displayed some of the birds from the State Game Farm. Six varieties of pheasants, Hungarian partridge and valley quail were on exhibition. This part of the exhibit was greatly appreciated by everyone. Crowds were often so great that it was almost impossible to approach the pens close enough to see the birds. Posters directed visitors to the main exhibit at the north end of the Horticultural Building, which as usual was planned and splendidly executed by W. H. Shebley, in charge Department of Fish Culture. The panorama used in former years was remodeled to represent Lake Tahoe and vicinity. The realistic painting and lighting effects were again the work of William G. Dobelstein, San Francisco artist. As in former years, the electrical display attracted much attention in that a very realistic storm effect was produced. The usual display of various kinds of trout and of methods in trout culture were utilized. The deputies in charge of the exhibit were in uniforms, giving visitors a chance to locate the men who might answer questions. Attendance was larger than ever before. It was estimated that 35,000 saw the exhibit on Admission Day and that the total attendance reached the quarter million mark. Visitors to the fair have found it to their advantage to visit the spectacular exhibits which have been arranged by the commission, and few there are who fail to view the panorama and the live trout.

NEW DOLLAR-A-YEAR WARDENS HELP LAW ENFORCEMENT.

Consensus of opinion is that the enforcement of the fish and game laws is becoming easier because of the help of dollar-a-year wardens and their deterrent effect on the violator. The violator, upon hearing that there are more than 100 under-cover men who may be encountered at any time, at any place, perhaps alongside him as he fishes a stream, is more careful, and there is a decreasing number of law violations. A number of cases have been made by these new men, and by their enthusiasm they are proving that this method of more effectively protecting fish and game is having satisfactory results.

PRESIDENT ZELLERBACH RECEIVES GOLD MEDAL.

Outdoor Life awards a gold medal to the man whose contribution to wild life

conservation is considered greatest. The past year this award came to the president of the California Fish and Game Commission, Mr. I. Zellerbach. Mr. Zellerbach's reorganization of the commission with resultant accomplishment brought to him this signal honor. A brief outline of accomplishments that may be attributed to him follows:

1. Installation of a business management of the commission's affairs with a business man in full charge as executive officer.

2. Incorporation of all expenditures of the commission under a strict budget.

3. Launching of a game farm—perhaps the largest in the world—near Yountville, where game birds are being propagated for liberation in California valleys and mountains.

4. Establishment of 15 holding ponds where fish fry will be permitted to grow to from 3½ to 5 inches in length.

5. Bringing of all wardens under strict civil service rules and requirements.

6. Calling of the first convention ever held of California fish and game wardens.

7. Strict enforcement, for the first time, of the law relating to reduction of fish, by fish packers, into fertilizers and poultry foods.

8. Strict enforcement, for the first time, of the laws relating to pollution of state waters.

9. Strict enforcement of the fish screen and fish ladder laws, and the enlistment of the best civil engineers in the employ of the public utilities corporations of the state in the task of devising a standard fish screen.

10. Inauguration of a cooperative, constructive fish and game policy for the benefit of all of the people of the state.

DUCK SEASON SHORTENED.

A change in the season for duck shooting, as promulgated by the Secretary of Agriculture earlier in the year, shortened the California season by fifteen days, opening under federal law on October 16 and closing under provisions of the state law on January 15. Under the laws existing prior to the new order issued by the United States Department of Agriculture, the season extended from October 1 to January 15, or three and one-half months in all. The California Fish and Game Commission immediately went on record as being in favor of a law to be submitted to the coming session of the California legislature adding fifteen days to the present existing season, making the closing date January 31 instead of January 15. This resolution was unanimously passed by the commission at its regular meeting on May 20, 1926. Pending a change by the state legislature, all deputies have been instructed to enforce to the letter the federal law.

Fig. 36. Panorama of Tahoe region which attracted much favorable comment at the Fish and Game Commission's exhibit at the State Fair, September, 1926.

WHAT WOULD YOU DO?

If you had gone to a sporting goods store and bought everything to go hunting, including in the outfit a perfectly good pair of binoculars. And if you had gone to the best deer country you knew the day before the season opened and had fixed up your camp to a queen's taste with high hopes of the morrow. And if when the morrow arrived you had swallowed your last bite of bacon and eggs and washed it down with a big draught of black coffee long before the break of day so you would be on the ground in time. And if after you had spent all morning in search of a buck and on your return to camp you had spied a whale of a buck and to make doubly sure had taken a look through your perfectly new binoculars and assured yourself it was a buck. Then if after looking with the glasses you were sure it was a buck and you had taken perfect aim, fired and killed it and had run over to where it fell with great anticipation. And if you found you had killed a doe, WHAT WOULD YOU DO?

Or, if you lived in or near Los Angeles and had traveled to the northeast part of Mendocino County, some four hundred miles, with great anticipation of the deer country and the opening of the season. And if you had wended your way out through the rough rugged rocky roads, that are not more than trails, to some secluded spot. And if you and your companion had just left camp on the morning of the opening day and your companion had sighted a buck and after looking at him with his glasses had said he was "an old whale and a three-pointer." And if he had told you to shoot while he watched and you had shot and scored a bull's eye, then found you had killed a spike buck, WHAT WOULD YOU DO?

Two men had exactly these experiences this fall. The first immediately went before the nearest judge and voluntarily paid a $50 fine. The second man took the deer to the nearest ranger station and was sent to the nearest justice of the peace. Not finding him home, he took the deer to Judge Whitney at Ukiah. As a result, no charges were made and the deer was sent to the county farm.

Do you not agree that both men were real sportsmen?

What would you have done?—John K. Hellard, Willits, Cal.

FEDERAL POWER AND DUCK BAG LIMITS.

In order to clear up some prevalent misconceptions, the National Association of Audubon Societies has made a study of "Federal Power and Duck Bag Limits" (Bulletin No. 6). A few of the most interesting facts brought out by this investigation are presented below:

It is untrue that 25 ducks per day may be killed every day throughout the federal season. Provided that ducks could be shot every day throughout the federal season, the average limit in the United States, as restricted by state laws, is approximately 15 a day.

But all states, except six, exercising their powers under the Enabling Act giving effect to the Migratory Bird Treaty, have laws further restricting the killing, either by reducing seasons, excluding Sundays, or by reducing daily, weekly, or seasonal limits, or by setting aside rest days on which ducks can not legally be shot.

State laws that result in reducing federal limits govern the *legal* limits.

Ducks are not native to any one state, but to the whole of the United States.

Those of California, Oregon and Washington are one great flock. How many ducks can be legally killed from this flock? Not the number permitted by law in any *one* of the states, but the average number legally permitted by this *group* of states as a unit, including adjacent states occupied by the same flock of ducks. The same holds true throughout the United States.

In law ducks are game birds. As such they are preserved for sport and food. Their economic value to the nation is high. It includes, besides food, employment and the whole train of industrial activities included in their chase.

Their unmeasurable value for recreation, including health-giving activities, is probably of still greater benefit to our people. The interest and unceasing work of sportsmen have been the forces which have so acted on public opinion as to bring about laws and methods to preserve the ducks. Nobody familiar with the history of game conservation could deny this fact.

A proportion of the people want wild fowl preserved, not for sport or food, but because of their enjoyment of wild life and of the beautiful in nature—a feeling shared also by sportsmen.

It is clear, however, that preserved up to their maximum numbers adjusted to the limits of their food supply, ducks will always provide a field of opportunity for nature lovers as great as that for sportsmen.

At present, ducks are probably at or beyond their food supply. Progressive drainage of marsh areas throughout the country and the lowering of the water level in some states have restricted their fall and winter habitats. They have been forced to concentrate in other areas and reduce their valuable food. These causes have led to disease and to the dangers of starvation: in some cases, to forced change of feeding habits, which have become a menace to crops.

Oil polluted and alkali waters annually destroy great numbers. Disease has been increasing. Adverse conditions on their breeding grounds have been destructive to ducks. How much we do not know, and can not know, until the breeding grounds shall be visited at the breeding time. Destruction of the food supply and methods of preserving and of increasing it. Droughts. An international treaty with Mexico. More systematic study of natural enemies. There are other serious factors.

This is the field that needs concentration and attention. In it, bag limits are insignificant factors. The agitation about them only diverts attention and work from being directed toward the vital problems.

AUDUBON SOCIETY HEAD LAUDS SPORTSMEN'S ORGANIZATIONS.

Here and there sportsmen's organizations of high type men have been formed. These groups as a rule pledge to observe the laws most carefully and it is to them that we are indebted for most of the wise, constructive legislation for protecting game in this country. Also they have collected and expended hundreds of thousands of dollars to secure prosecutions, to maintain game breeding farms, and to restock with game covers that have been depleted. They maintain a number of widely read magazines with militant editorial policies directed to the strengthening of conservation ideals.

Although enjoying the sport and the healthful exercise acquired by going afield with dog and gun, their killing is moderate and they constitute the largest effective force for the preservation of the game in the country. It is to be lamented that there are not more such organizations. Mr. John B. Burnham, president of the American Game Protective Association, advises me that the total organized sportsmen of the United States do not exceed 500,000, while the government reports that not less than 6,000,000 men go afield annually for the purpose of shooting. In a general way, I should divide the hunters of America into two groups, sportsmen and killers. The former should have our cooperative support, the latter need our earnest attention.

There is vast need for education along sane conservation lines in this country if the nation is to reap the greatest benefit from its natural supply of wild game birds.—T. Gilbert Pearson.

TRUE SPORTSMEN.

The way of the game warden would be made much easier if every hunter were as true a sportsman as are five guides of Monterey County. All parties engaging these men are informed that should any of the employers violate in any way the bag limits or other game laws, the guides would immediately desert them and leave them to find their own way out of the Santa Lucia or Gabilan ranges.

RAREST OF BIRD'S EGGS DISCOVERED IN ALASKA.

Bird egg collectors have found and placed in museums specimens of the eggs of practically every known species of bird. A few species only have eluded the prowess of the egg collector. It remained for two scientists from the University of California, Museum of Vertebrate Zoology, Mr. Joseph Dixon and Mr. George Wright, to uncover the secret so long held by the surf bird *Aphriza virgata*. A well known winter migrant along the California coast, the surf bird nests in the far north and an expedition to the interior of Alaska was necessary, followed by long days of searching before the prize was obtained. The nest was found on the bare tundra high up on a mountain 1000 feet above timberline. The eggs, reported as buffy-brown in ground color with chocolate-brown and violet markings, were being incubated by the male bird, a common habit among shore birds. A full account of the discovery will appear in the January number of *The Condor*, a magazine of western ornithology.

BUFFALO ONCE NATIVE OF CALIFORNIA.

In 1922, Dr. C. Hart Merriam called attention to the fact that prior to 1850 the buffalo ranged as far west as the area termed "Eastern California," which usually meant eastern Utah or western Wyoming, and that there was no definite record for any locality west of eastern Oregon. In the *Journal of Mammalogy*, Vol. 7, pp. 211–214, he discusses further the western range of the buffalo and points out that inquiry has shown that the Pit River and northern Piute Indians knew the animal well and have much to say of its former range in their country. Dr. Merriam sums up the matter as follows: (1) The buffalo did not push westerly around the *south* end of Great Salt Lake; (2) there is no record of its occurrence on the west side of Salt Lake, or in the valley of Humboldt River, or anywhere in the vast desert region between Great Salt Lake and California; (3) it entered California—and probably also a narrow strip along the extreme western border of northern Nevada—*not*

from the east but from the north, coming south from Oregon.

"With these facts in mind, the extension of the buffalo into the open valleys of northeastern California, carrying its range at least 250 miles southwest of Peter Ogden's record, marks another step in the knowledge of the distribution of this great animal—an animal that stands alone, whether viewed from the standpoint of food, clothing and shelter it afforded the original inhabitants, or from its influence in developing the traits of courage, alertness and skill for which our plains tribes were famous."

As a consequence, California must add this well known big game mammal to her list of extinct species.

BEAVER DISAPPEARING IN SAN JOAQUIN VALLEY.

Deputy George Smalley reports that no beaver sign is now to be found along the lower reaches of the Merced and San Joaquin rivers in Merced County. Since protection was removed from beavers at the last session of the legislature, nearly 750 beavers have been killed for their pelts in this region. It is estimated that between 275 and 300 were trapped near Mendota and fully 300 along the Merced River near Snelling. The pelts brought an average of $15 apiece. Total protection brought beaver up in numbers to the point where they caused property damage. We are now noting the result of non-protection.

DUCKS SUCCESSFULLY REARED.

One of the finest collections of live ducks in the state is owned by J. V. De Laveaga of San Mateo. His collection now numbers 62 distinct species of ducks and 17 species of geese. He has varied, fulvous, white-faced, red-billed, gray-breasted, wood and spoon-bill ducks, European widgeon, rosy-billed pochard and Chilean pintail. Perhaps the most interesting bird that he has raised is a male white-eyed pochard. As far as is known, this is the only one of its kind in the United States.

CHEMICAL COMPOSITION OF FISH CHANGES WITH AGE.

Mr. A. S. Pearse of the Zoological Laboratory of the University of Wisconsin has written a very interesting article on "The Chemical Composition of Certain Fresh-water Fishes," the conclusion of which is reprinted here:

The observations described in this paper give a general idea of the gross chemical changes that take place in trout and perch during development and adult life. After the eggs are laid, they absorb water. During the growth dependent on the utilization of stores of nourishment in the eggs, fat and nitrogen are used up, ash remains fairly constant, and the proportion of water increases. After a young fish begins to feed, its nitrogen increases somewhat, then remains more or less constant through adolescence and adult life. Fat also increases for a time but after the first year undergoes periodic seasonal fluctuations. As fat increases water decreases and *vice versa*. The increase in fat takes place during the summer, when water is warm and less dense, and when food is most abundant. In winter, when the water is cold and dense, and food is less abundant, fat decreases. Taylor (1922) has suggested that fat may serve a hydrostatic function in fishes—making them lighter by increasing when water is less dense and heavier by decreasing when water is denser—and the writer's observations on the seasonal fluctuations in fat support his view. However, no correlation between vertical distribution and amount of fat was found. This may be because other hydrostatic mechanisms, such as the swim-bladder, are more important in making adjustments to pressures caused by differences in depth.

Moulton (1923) maintains that the composition of animals should be compared on a fat-free basis and that, if this is done, "mammals show a rapid decrease in relative water content and increase in protein (nitrogen) and ash content from earliest life until the time of chemical maturity is reached. At this time the change becomes rather suddenly less, and nearly constant composition is shown."

In another paper (Pearse, 1924) an estimate has been made of the amount and variety of food used by certain fishes. It seems reasonable to assume that a fish consumes an amount equal to about 5¾ per cent of its own weight per day. Judging by consumption of certain foods that were analyzed by Birge and Juday (1922) and also fed to fishes by the writer, the caloric value of foods commonly consumed by fishes is considerably greater than their own. Until the basal metabolism of a fish has been determined at different temperatures it will not be possible to estimate the daily and annual caloric requirements of fishes with any accuracy. In summer a fish appears to eat enough to supply calories equal to about 15 per cent of the caloric value of its own body daily. If all the food is digested and its full caloric value utilized, which is unlikely, a fish has a high rate of "overturn" for its body substances.

There are various factors which limit the number of fishes that may exist in any body of water. The amount and quality of available food is important; also the average rate of overturn (rate of reproduction and length of life) of living food resources. Another important requisite is the ability and opportunity of the fishes to reproduce. The

number of adult perch in Lake Mendota, which contains 478,370,000 cubic meters of water, must be several millions (Pearse and Achtenburg, 1920, pp. 313, 314, 332). If these could find food and produce offspring without check the lake would soon be filled with perch. In April, 1921, the writer caught ten female perch and estimated the number of eggs. The average was nearly 10,000 for each. It is evident that there must be enormous losses between the laying of the eggs and the attainment of maturity. When scientists are able to make out actuarial tables for perch, rates of insurance will undoubtedly have to be high. The problems for those who wish to increase the yield of fish from aquatic habitats are evident: (1) Search for means to increase the amount, quality, and availability of food resources, and (2) discover how to make it possible for more fishes to survive to maturity and find favorable conditions for growth.

AREA ADDED TO SEQUOIA NATIONAL PARK.

The Barbour Bill has added 352 square miles to the Sequoia National Park, which now includes Mount Whitney, the stupendous canyon of the Kern, the Kaweah Peaks and the imposing mass of the Great Western Divide. In addition the adjoining Mineral King District has been created a game preserve.

What this will mean to the wolverine only time can tell. The wolverine, or "glutton," the largest of the weasel family, is now making its last stand in the southern Sierra. If there is a sufficient breeding stock left, it will find a necessary breeding ground in the added Kern-Kaweah watershed, where it will receive complete protection. It is significant that within this general region only eight wolverines have been trapped within the past few years.

It is also expected that mountain sheep, now practically confined to the main Sierra range on the Inyo side, will gradually return to their old range on the Kaweahs and Great Western Divide. It is hoped that hikers to Alta and Silliman may within a few years be afforded a sight of these now rare animals. The experience of park protection at Grant Canyon National Park makes it certain that the larger mammals will multiply in the added park area.

It has been suggested that the dry seasons are responsible for the marked increase among the wild life of the Sequoia National Park. The fawn crop at Giant Forest is above normal. Many does with twins have been feeding about the public camps. The does and bucks are so tame that they will eat from one's hand. Grapes and melons seem to be the favorite food.

Bear are also numerous despite the fact that many must have drifted to slaughter outside the park last fall. Twenty-two bear, including six cubs, have been counted at the garbage incinerator.

KAIBAB FOREST TO BE OPENED TO DEER HUNTERS DURING OCTOBER.

Deer hunting on the Grand Canyon National Game Preserve in the Kaibab National Forest, Arizona, will be permitted during the period October 1 to 31, according to advice received by the California district headquarters of the United States Forest Service in San Francisco. Each person will be allowed one male deer, and hunters must have a government agreement and a state license before going to a hunting camp. Government agreements cost $2.50 each, resident state licenses $1.25 each and nonresident licenses $20 each. Two checking stations, where agreements and licenses may be purchased, have been established at Ryan on the west side of the forest and at Kane on the east side.

The Kaibab National Forest was made a game preserve by President Roosevelt in 1906 and the game was protected from hunting, and an active campaign against their natural enemies, lions and wolves, was conducted by the Biological Survey. Under this protection the deer grew from a small herd of a few thousand very rapidly until in 1925 it was estimated that it contained between thirty and fifty thousand deer.

The opening of the forest for hunting was first made in 1924 and has been continued each year since. This has been done in an effort to reduce the herd, which was increasing so rapidly that the available forage was becoming exceedingly short and there was much danger that the herd would be exterminated by starvation. Furthermore, the foresters found that a great deal of damage was being done to reproduction and timber by the deer.

Those desiring further information regarding hunting on the Kaibab Forest should correspond directly with the Forest Supervisor, Kaibab National Forest, Kanab, Utah; the District Forester, Ogden, Utah, or the Arizona State Game Department at Phoenix, Arizona.

DR. JORDAN DISCUSSES FISH AND GAME CONSERVATION.

On the evening of Monday, July 26, Dr. David Starr Jordan addressed an enthusiastic audience at Monterey upon

the subject of "Preservation of Our Natural Resources." The address was illustrated by motion pictures, loaned for the occasion by Californians, Inc., and the Fish and Game Commission. Dr. Jordan, who is reputed to know more about fish than any other man in the world, warned the fishermen or "sportsmen" in his audience that the brook trout or "steelhead" (he asserts they are one and the same) in this locality are not nearly as numerous as they formerly were, and that overfishing may practically exterminate them in time, just as the passenger pigeons, once so prolific in the forests of the east and middle west, are now completely gone. The last one died last year. Chinook or King salmon, which abounds in Monterey Bay at certain times of the year, many of them going north to the Klamath or other colder waters to spawn, is the finest of all salmon. In the fourth year it reaches about 18 pounds weight. Then they spawn and die. All the five species of Pacific salmon, male or female, die after once spawning. A certain number may live to 6 or 7 years before spawning, these steadily growing, reaching in Alaska a weight of 60 to 80 pounds. As we have a greater number of species of fishes right here in Monterey Bay than occur on any other northern coast, we should take better care of them and see that conditions are in every way most favorable for their perpetuity.

The crude oil from tankers, Dr. Jordan asserted, is the curse of the Pacific coast. A national law should be passed to end this oil-dripping that annually kills untold thousands of sea birds, fish, clams—all manner of sea creatures and water birds, as well as enormous quantities of plankton, the more or less invisible creatures at the surface, on which many young fishes feed. Birds are destroyed mainly because their wings become saturated with oil.

Speaking of fishermen and hunters, Dr. Jordan divided them into two classes, "killers or hogs" and "sportsmen." The former are the ones who are a menace to the future of our natural resources.

Speaking briefly of the conservation of deer, mountain goats, large birds such as the blue heron, that feeds on plant-destroying gophers, some owls, that eat grain-destroying field mice, and of ducks—the preservation of which is most difficult because of conflicting state rights as well as of misunderstandings of the work of the Biological Survey of the Department of Agriculture—Dr. Jordan ended his address with a plea for special protection of the little song birds, which devour yearly millions of mischievous insects.

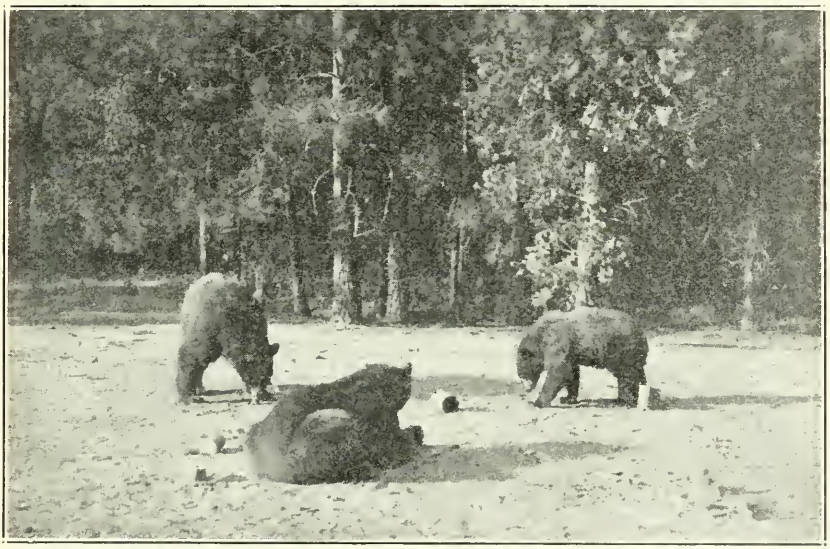

FIG. 37. Black bears in Yosemite.

ADVERSE FACTORS MENACING WILD FOWL.

In the July number of *The Oregon Sportsman* appears an interesting article

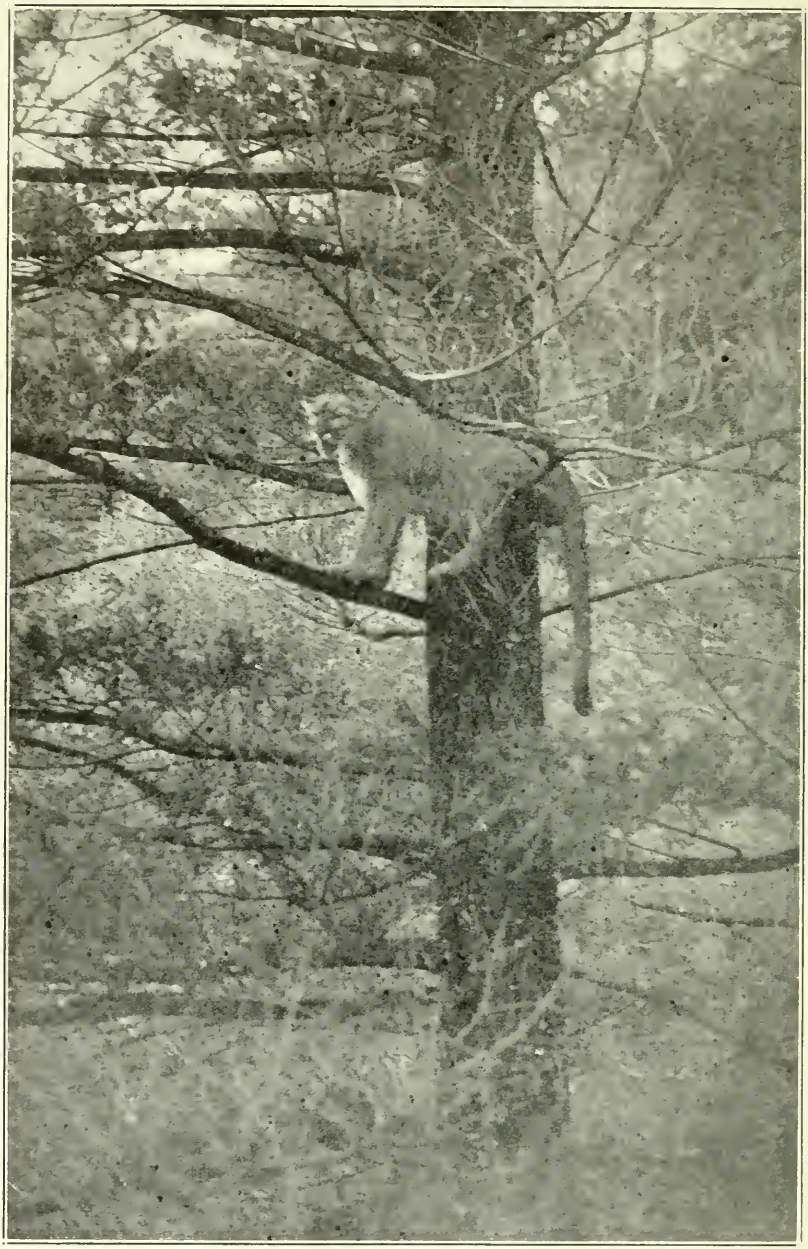

FIG. 38. Mountain lion treed and photographed by J. R. Hill of Covelo, Mendocino County.

by Edward W. Nelson, chief of the Bureau of Biological Survey, on "Our Migratory Wild Fowl," excerpts of which article are reproduced here:

There are apparently two great adverse factors directly menacing the perpetuation of our migratory wild fowl and these overshadow all others. One is the drainage of water areas by man, and the other is a succession of years of scanty rainfall, and its effect on a great area in the west, as indicated by the disappearance there of many ponds and small lakes.

In efforts to conserve the big game animals of the country it has been found that man has occupied most of their former wintering grounds, and the great conservation problem has been one of sufficient winter forage, the summer forage being usually abundant. In the case of migratory wild fowl, there is arising a like problem—that of maintaining sufficient water areas where the birds may feed during their migration and in winter, but there must be retained undisturbed breeding grounds, the basis of all wild fowl production.

The danger to the perpetuation of the stock of wild fowl is so great and so imminent from the causes mentioned that there is the most vital need for all conservationists and lovers of wild life to sink petty differences of opinion as to details and to unite in constructive work to insure the future of our migratory game birds.

Seventy-five years ago California had many hundreds of thousands of acres of lakes, marshes and grassy plains, where untold millions of ducks, geese and other migratory wild fowl found a winter paradise. With the increasing population of that state, the occupation and drainage of these areas has steadily progressed, until the great Tulare and Buena Vista lake basins and marshes in the San Joaquin Valley have become absolutely dry. Practically all the many ponds and lagoons which once occupied the coastal plains of southern California have been drained or filled and have disappeared forever.

Tule Lake, once a large shallow body of water, near the northern border of California, was formerly the winter home of myriads of ducks and geese, while many stayed there to breed. Forming as it does a part of a developing irrigation district, within the past few years it has been drained until now only an insignificant water area remains, forming a sink in the bottom of the old lake bed. The drainage of Tule Lake has been accompanied by some drainage of the neighboring Clear Lake, a federal bird reservation and still a great breeding ground for wild fowl.

The last great marsh area left in California is in the Sacramento Valley, but the water that hitherto has been used for flooding great marsh and rice-field areas in this valley must now be permitted to flow down the channel in order to maintain a navigable depth in the Sacramento River. This is a serious menace to this great area formerly available for migratory birds, and may be the culmination of adverse changes that have progressively destroyed one after another the homes of wild fowl in that state.

NEW TUNA BOAT TO BE CORK LINED.

Several years ago the Commercial Fisheries Department prophesied that attempts would soon be made to equip boats with refrigerating apparatus in order that fish might be landed in the best condition. At least three boats fully equipped are now transporting fish from Mexico to southern California ports. Within the last year, several boats have been especially built to facilitate icing the fish, but lacking refrigerating plants. Last fall a cork insulated boat was built at San Pedro and now M. O. Modena and J. A. Soares have ordered a similar cork insulated boat, according to the *Pacific Fisherman* (August 26, 1926). At first it was planned to equip this boat with an ice plant, but afterwards decision was made to use cork insulation. This boat, 110 feet long, will be one of the largest of the tuna fishing boats and will be manned by eight officers and men. Two-inch sheets of cork and asphaltum are utilized in the insulation. This cork insulation has been proved far superior to other insulation materials that have been tried out in past years.

THE ELIMINATION OF "HAFF SICKNESS."

Discovery of the cause of the mysterious "Haff sickness" which was proving ruinous to a large part of the German Baltic fisheries industry, together with the elimination of the disease virtually by government fiat, is announced at Berlin by officials. It is one of the very few cases on record where an edict had power to end an epidemic, or at least what looked like one.

A little over two years ago, fishermen in the stretch of shallow water along the southern end of the Baltic between Koenigsberg and Danzig, known locally as "the Haff," began to develop a very painful and in some cases fatal disease. Its symptoms were extreme pain and a kind of paralysis of some of the leg muscles, together with certain physiological disturbances. It always attacked its victims while they were out in their boats, and generally in the early morning while the mists still hung over the water. A few days on shore usually resulted in complete recovery, but a return to fishing might bring on repetitions of the malady.

In a short time the Haff fisheries were badly demoralized.

The theory that it might be an epidemic of a germ disease quickly went by the board. The "Haff sickness" had none of the earmarks of an ordinary epidemic. Likewise the theory that it might be caused by the eating of spoiled fish or eels had to be abandoned, because many of the victims did not eat fish, and fish-eaters on shore never suffered from the disease.

The investigators finally came to the conclusion that there must be something in the water that rose into the morning mists and caused the disease by poisoning the air. Research along this line soon showed that they were right. The disease was really a kind of arsenic poisoning, caused by the discharge into the water of great quantities of factory wastes from cities on shore. These wastes contained arsenic compounds, which were altered into gaseous form by small organisms living in the water, and thus released into the air to plague the luckless fishermen. The arsenic was present in the factory materials only as an impurity, so that it was no hardship to the industries when the government ordered them to change to the use of other materials with a lower percentage of arsenic. Within a few months the "Haff sickness" had virtually vanished.—*Science*, July 30, 1926.

H. P. SHELDON APPOINTED CHIEF U. S. GAME WARDEN.

Harold P. Sheldon, fish and game commissioner of Vermont, has been appointed by Secretary of Agriculture Jardine to be chief United States game warden of the Bureau of Biological Survey. He will fill the vacancy caused by the resignation of G. A. Lawyer, and will assume his new duties early in July.

The experience gained by Mr. Sheldon as state game commissioner of Vermont during the past five years well qualifies him for his new duties. He has been responsible for the administration of the fish and game laws of Vermont, also of the State Fish Hatcheries, the State Game Farm, and the Migratory Bird Sanctuary at Milton, Vermont. His name stood first on the eligible register, resulting from the civil service examination for the position.

As chief United States game warden, Mr. Sheldon will be in charge of the enforcement of two federal game laws, the Migratory Bird Treaty Act and regulations protecting birds migrating between the United States and Canada, and the Lacey Act regulating interstate commerce in game.

Mr. Sheldon is a native of Vermont, and before his appointment as state game commissioner was an assistant editor in the Office of Information of the Department of Agriculture at Washington. While in Washington after the war, he studied law and took special courses at both Georgetown and George Washington universities. He is author of many articles relating to fishing and shooting and the conservation of wild life. During the World War he served in France as first lieutenant in the 102d Machine Gun Battalion, and was later made captain. His services at the front were ended by a serious wound received in action, from which, however, he has fully recovered.

CHIEF U. S. GAME WARDEN SHELDON SAYS CONSERVATIONISTS ARE WINNING.

H. P. Sheldon, who recently assumed his duties as chief United States game warden of the Biological Survey, holds that the American sportsman is winning in his fight to conserve and perpetuate the wild game of the United States. As state game and fish commissioner of Vermont during the past five years, Mr. Sheldon has been in close touch with the activities of the many agencies cooperating in the work of game conservation, and speaks with a knowledge born of experience.

"A study of the present game situation in the United States," he says, "does not seem to warrant the pessimistic declarations we commonly hear. The melancholy atmosphere that some adopt when speaking of game conservation is an inheritance from the dark period in American game history when destruction was the rule, and when the scattered, unorganized sportsmen had not yet found the weapons with which to check it. That distressing period is definitely concluded and I sincerely believe that we are well forward in a new advance, which will be marked by constant increase in the numbers of our valuable species of fish, birds and animals."

The year 1960 will not offer to the individual the abundance of game that was available to the sportsman of 1860, but the future, he prophesies, will certainly provide a reasonable abundance of game to a greater number of sportsmen, if present policies and projects are consistently adhered to.

"Never before have the sportsmen and conservationists of America been so strongly and effectively organized; never before have the official agencies of conservation found such large sums of money at their disposal for advancing their work, and never before have we seen game and fish laws and regulations more generally supported by public approval than at the

present time. A glance at the game registers proves that the destruction of game that went on throughout the century just past has now been solidly checked, and that most species, particularly the migratory birds, are actually increasing. We are now able to count a profit where heretofore we have had to realize an annual loss. Slight though these gains may be, they represent the wide difference between victory and defeat. These gains indicate also that the policies and systems of game conservation, the legislative structures, and the educational and enforcement agencies that have been formulated after a century of conflicting opinion, narrow prejudice, apathy and ignorance, are right in their main principles and that we may safely expand them to increase future effectiveness.

I do not wish to assert that all obstacles are safely past. There are many to which the sportsman and his agents must apply the most powerful solvent that money, interest and cooperative effort and thought can distil. There is pressing need for antipollution laws, the training and employment of an adequate force of game protectors, provision for expanding the areas needed for the care and feeding of our increasing stock of game, the reduction of vermin, the study and control of disease, and the troublesome problem of harmonizing the rights of the landowner with the recreations of the sportsman who owns no shooting or fishing preserve.

These, and many other requirements, seen and unseen, must be met, but I believe that past accomplishments warrant us in regarding the future with confidence. We shall overcome our difficulties because we are at last beginning to comprehend the sense of the biblical instruction that 'a house divided against itself can not stand,' and that a safe, consistent, effective game conservation policy for America depends upon the submergence of personal discord. We require complete cooperation between the legislation of conservation and the science of conservation; between the state departments and commissions and the Federal Bureau of Biological Survey; between state and state, farmer and sportsman, and sportsman and warden."

Mr. Sheldon believes that the American sportsman, whose interest and support has made this progress possible, is entitled to the stimulation of quiet optimism as he prepares for the continuation of his effort to preserve and perpetuate our wild life.

PLOVER SEASON CLOSED BY FEDERAL REGULATION.

A continuous closed season has been prescribed throughout the United States on black-bellied and golden plovers, according to the Biological Survey of the United States Department of Agriculture, which is charged with the enforcement of the Migratory Bird Treaty Act. Hunters are reminded by the bureau that persons killing these birds are subject to prosecution in federal court. Greater and lesser yellowlegs, however, may still be hunted legally during certain open seasons, which are as follows:

In Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland and Virginia from August 16 to November 30;

In the District of Columbia, North Carolina, South Carolina, Tennessee, Arkansas, Oklahoma, Texas, New Mexico, Arizona, California and Alaska from September 1 to December 15;

In Vermont, Pennsylvania, Ohio, West Virginia, Kentucky, Indiana, Michigan, Wisconsin, Illinois, Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska, Kansas, Colorado, Wyoming, Montana, Nevada and that portion of Washington lying east of the summit of the Cascade Mountains from September 16 to December 31;

In Utah, Oregon, Idaho, and that portion of Washington lying west of the summit of the Cascade Mountains from October 1 to January 15; and

In Georgia, Florida, Alabama, Mississippi and Louisiana from November 1 to January 31.

NTERNATIONAL CONGRESS HELD IN COPENHAGEN.

The Sixth International Ornithological Congress was held May 24–29, 1926, in the Danish Parliament Building in Copenhagen. Here were gathered ornithologists of many nations, scientists, explorers, big game hunters, and skin and egg collectors in great number.

The committee appointed to consider the protection of ducks reported, through Mr. Schioler, that they recommended a conference of nations immediately concerned, and that the governments should appoint delegates to draw up a report dealing with the conditions in their own countries. The committee considered it advisable that complete protection should be given during the period of pairing and migration, as well as during the actual nesting period.

It was firmly decided that bird protection must be international as well as national.—*Bird Notes and News*, Vol. 12, No. 2.

ECONOMIZE ON PINK SALMON.

A recent publication of the U. S. Bureau of Fisheries (Economic Circular No. 48) discusses red as against pink and

chum salmon. For a great many years only red meated kinds of salmon were canned, so that the public came to associate the color with the product. As a result, pink or pale-fleshed fish have been regarded with disfavor or suspision. Even light-meated chinook salmon have not found a ready market. However, color is a matter of appearance only. Pink and chum salmon may be equally wholesome and mean certainly more economy. "Pink and chum" usually contain less fat but are equal to the red varieties in protein—tissue building material. They are low priced because of their abundance and the use of labor-saving machinery in handling and canning them. Their high protein content and lower color render them more economic than most animal foods in common use.

The same bulletin calls attention to the fact that iodine is contained in canned salmon, and that foods rich in iodine have been found to be very efficient in the prevention and treatment of goiter.

Forty-four recipes for using pink and chum salmon are included in the bulletin.

FIG. 39. Learning to be a sportsman. Bruce Fleckenstein with honker goose and .410 shotgun. Photographed by C. I. Fleckenstein.

CHEMICAL COMPOSITION OF PACIFIC COAST CRABS.

A bulletin by C. R. Fellows and C. T. Parks (Univ. of Wash. Publ. in Fisheries, 1, pp. 139–156) reports on the biochemical properties of the Pacific coast and Japanese crabs. The summary follows:

The proximate composition of raw and canned Pacific coast crab (*Cancer magister*) is reported for the first time. Analyses are also reported for the Japanese crab (*Paralithodes camtschatica*). Though totally unlike, these two species are remarkably similar in composition and food value. Very little variation in composition was found within the same species, except in fat content, which constituent increases during the winter and early spring until the spawning and moulting season occurs. At this time the crabs become thin and watery and of less value as food.

The Japanese and Pacific coast crabs contained respectively 362 and 102 parts per billion of iodin—a very high figure.

The presence of struvite crystals ($MgNH_4PO_4 \cdot 6H_2O$) was demonstrated in the canned flesh of both of the species studied. This substance has been mistaken for glass by the public.

Fresh crab meat contains the active oxidizing enzym tyrosinase which rapidly changes the color of the raw meat first to a dirty gray then to a deep brown color.

The blue discoloration often observed at the joints of the leg sections and at the muscle ends is not iron or copper sulfid, but probably results from a modified biuret reaction, resulting from the interaction of biuret (urea—NH_3) and copper, both from the blood of the crustacean, in the presence of ammonia.

The black discoloration in canned crab is iron sulfid due to the reaction of sulfur compounds from the flesh with iron from the container. A discussion of the discoloration reaction is given, together with suggestions for its suppression or retardation.

The use of quantitative indol, ammonia or bacteriological tests to detect spoilage in crab meat are unsatisfactory because such degradation changes as occur for many hours after death are entirely autolytic in character. So active in this autolysis, that crabs dead only ten hours show visible evidences of muscle disintegration accompanied by marked physical changes which make the flesh unsuitable for food. At a temperature of 65° F. crabs are suitable for food up to about six hours only.

Hydrogen sulfid in raw crab meat increases in amount only after about ten hours from death. There is a regular increase with time after ten hours at 65° F. and the presence of over two parts per million of hydrogen sulfid indicates decomposition has occurred.

The bacterial flora of raw crabs consists largely of cocci and members of the colon-aerogenes group. Micro-organisms do not ordinarily penetrate into the flesh of crabs for from 20 to 36 hours after death. The body meat is infected first, the infection coming largely from the mouth and surrounding parts and the gills.

MARKED FISH RETURN.

An extraordinarily heavy return of marked salmon is astonishing all elements of the Columbia River fishing industry and is attracting the attention of fish scientists throughout the Pacific northwest.

The present catch of blueback salmon is featured by an unusual number of marked fish with the adipose and left central fins clipped. These fish are part of the 100,000 bluebacks marked at the Enterprise Hatchery and released in the spring of 1924, when they were already 18 months old.

Harlan B. Holmes, fish scientist with the federal bureau of fisheries, had collected the marks from more than 200 fish, Tuesday, and large numbers of the marked fish are still coming into the river. In some cases more than half of the bluebacks delivered to Astoria canneries bear the marks.

This is said to be by far the most notable return of marked fish resulting from any fish branding experiment ever undertaken in Oregon. It proves the efficacy of artificial propagation and the value of holding the young fish until they are a year and a half old before they are released.—*The Oregon Sportsman*, July, 1926, page 24.

SALMON MARKING EXPERIMENTS IN OREGON.

A series of salmon marking experiments, which have been conducted for a number of years on the Columbia River by the bureau in cooperation with the Oregon Fish Commission, yielded valuable information during the 1925 season. Approximately 100 adult chinook and 50 sockeye salmon, which had been marked by removing certain of their fins when they were liberated from the hatcheries, were recovered as they returned to the Columbia River to spawn. The sockeyes represent the first returns from 100,000 yearlings that were marked and liberated during February, 1924. The recovery of so large a number of three-year-olds gives promise of exceptionally good returns from the experiment. The fish in another sockeye experiment, in which the young fish were liberated during the fall of their first year, should have been five years old in 1925, but no returns were received.

This experiment seems to have been a total failure, as no three- or four-year-olds were recovered. These results agree with those from former experiments in showing that when it is not possible to liberate sockeyes in a lake in which they can remain until the spring of their second year (which is their natural time of migration), they should be held in rearing ponds until that time.

About 50 of the marked chinooks recovered were three-year-olds that had been marked at the Big White Salmon River Hatchery during May and June, 1923, when they were about five months old. Here, also, the recovery of a large number of three-year-olds gave promise of good returns as four- and five-year-olds. This one year's returns from this experiment nearly equal the total returns from two former experiments, which differed from this one mainly in that the fingerlings were retained for about three months longer before being liberated. The greater returns from this experiment would indicate that the best time to liberate the chinooks that spawn in the Little White Salmon and Big White Salmon rivers is during the spring of their first year. This is to be expected, for a study of the scales of the fish that spawn in those tributaries has shown that normally they migrate to the ocean within a short time after hatching.

In order to determine the best time to liberate fingerlings of the spring run of chinook salmon, a series of marking experiments was undertaken in 1925 at the McKenzie River Hatchery. This series consisted of five markings with liberations ranging from May of the first year to March of the second.

In addition to conducting the marking experiments on the Columbia River, H. B. Holmes has been making a study of the blueback salmon of the Columbia. Representative samples of scales and measurements were collected from the commercial catch at intervals throughout the season, and observations were made of the seaward migrants and the spawning adults in the Okanogan River spawning district. —*Bureau of Fisheries Document No. 1003*, by Willis H. Rich.

CORRECTION.

In the July, 1925, issue of CALIFORNIA FISH AND GAME, page 147 shows 106,275 pounds of bluefin tuna brought into California from Mexico via San Pedro. This should have been reported as yellowfin tuna, and added to the amount of yellowfin tuna brought into California from Mexico.

In the October, 1925, issue of CALIFORNIA FISH AND GAME, page 193 shows 33,406 pounds of bluefin tuna as brought into California from Mexico via San Pedro. This should have been reported as yellowfin tuna, and added to the amount of yellowfin tuna brought into California from Mexico via San Pedro.

In the April, 1926, issue of CALIFORNIA FISH AND GAME, page 115, there is shown 8225 pounds of bluefin tuna brought into California from Mexico via San Pedro. This amount should have been reported as yellowfin tuna and should be added to the amount of yellowfin tuna brought into California from Mexico via San Pedro.

NEW BULLETIN ISSUED ON GAME LAWS.

"Game Laws for the Season 1926–27," the twenty-seventh annual summary of federal, state and provincial statutes relating to game, has been compiled by Talbott Denmead and Frank L. Earnshaw, of the Biological Survey, and published as Farmers' Bulletin No. 1505–F by the United States Department of Agriculture. The outstanding information presented is the summary of laws relating to seasons, licenses, limits, possession, interstate transportation, and sale, for each state and province, in the form of detailed but concise synopses, which should be highly useful to thousands of sportsmen hunting in their own and other states.

Federal seasons on migratory game birds were changed during the year by amendments to the regulations respecting waterfowl and shorebirds, as follows: The open season on waterfowl, coots, gallinules and Wilson snipe was changed from the period September 16 to December 31 in Illinois, Indiana, Washington east of the Cascades, and Massachusetts in Nantucket and Dukes counties to the period October 1 to January 15, and in Kentucky to the period November 1 to January 31; in New Mexico and California the season was changed from the period October 1 to January 15 to October 16 to January 31. The season on doves was changed from the period September 1 to December 15 in South Carolina to October 16 to January 31. The open season on black-bellied and golden plovers was closed for an indefinite period.

Only eleven states have held legislative sessions since the bulletin on the game laws for the season 1925–26 was issued—Georgia, Kentucky, Louisiana, Massachusetts, Mississippi, New Jersey, New York, Rhode Island, South Carolina,

Virginia and Washington. The authors of the bulletin state that most of the changes during the year in the laws relating to game have been of minor importance except in Louisiana, Mississippi, Virginia and Washington, and that the most significant feature in connection with state legislation on game this year is the absence of provisions setting aside refuges for game animals or birds.

The game law bulletin is now being distributed to law-enforcement officials, conservationists, sportsmen and others as an aid in the administration by the Biological Survey of laws protecting migratory birds and regulating interstate commerce in game. Copies of the bulletin can be had, as long as the supply lasts, on application to the United States Department of Agriculture, Washington, D. C. Hunters are urged to procure also copies of state game laws from their respective state game and conservation officials, a list of whom is given in the new bulletin.

FACTS OF CURRENT INTEREST.

The Sardine Bulletin, Fish Bulletin No. 11, which gives the result of years of investigation, is in press and will soon be ready for distribution.

Many of the state hatcheries have undergone extensive repairs during the summer and are in much better condition for fishcultural operations. The Mt. Shasta Hatchery, the largest of California's hatcheries, has received some much needed repairs and a number of new installations which will improve the output of this hatchery.

Nearly 4000 feet of new motion picture film has been purchased and assembled. The new reels are now available.

The eggs of the surf bird, one of the state's migratory shore birds, were discovered for the first time during the past summer in central Alaska by a party from the University of California.

Golden trout are again being reared in the Mt. Whitney Hatchery, eggs having been secured from the Cottonwood Lakes Station.

Owing to a change in the federal regulations the season on ducks will not open until October 16. State law closes the season on January 15, thus reducing the season from three and one-half to three months.

During the month of August the formal dedication of the State Game Farm and of the site of the new Yosemite Hatchery took place.

Large numbers of pheasants, raised at the State Game Farm, have been liberated in suitable locations during the past few weeks.

COMMISSION ACTIVITIES.

Department of Patrol.

Game Warden George Johnson, of Napa, recently took four residents of that section red-handed in the slaying of a spiked buck. Two of the party pleaded guilty to the charge before Justice Charles Snow and paid fines of $150 each, and were sentenced to two years probation with the provision that they get rid of their dogs and discontinue hunting deer in this manner. A third member of the party was given a two-year probation sentence with a warning against use of dogs. The fourth, being under legal age, was given probation with the understanding that he hunt no more until the end of his term and get rid of his dogs immediately.

A few nights later, while driving along one of the Napa Valley roads, together with a "dollar-a-year" warden, Johnson saw still another alleged sportsman of that region shoot a deer focused in the glare of a spotlight. Johnson immediately put the gunner under arrest. He pleaded not guilty when arraigned before Justice Snow, and was placed in the county jail in default of $50 bail.

Game Warden Jack Burke, of San Mateo County, recently undertook a stringent campaign against rabbit shooters in his district, one of the first fruits of which was the taking of an Italian resident of San Francisco. This party was seated on the fender of his automobile, shooting with a .410-gauge shotgun. When taken before Justice Griffin, of Redwood City, the hunter pleaded guilty and was fined $50 for shooting from an auto, $25 for having no license and $25 for shooting rabbits.

A gunny sack and suit case containing thirty packages of "jerky" marked at $1.25 per package proved the undoing of Henry Bristol and Evans McDonald, of Arcata, when they were apprehended recently by Game Patrolman McPherson Lough. Taken before Justice of the Peace Adams, at Arcata, Bristol entered a plea of guilty and was fined in the sum of $100. McDonald, who is but 17 years of age, entered a plea of not guilty and his case was certified to the juvenile court of Humboldt County. The pair were traveling along a county road when overhauled by Patrolman Lough. The charge was a dual one of taking deer out of season and of possession of deer meat in a closed season.

Bristol elected to spend 100 days in jail in lieu of the fine. McDonald was remanded into the custody of Sheriff Arthur A. Ross pending his trial.

An ultimatum in no uncertain terms was handed out to "game hogs" when Justice W. Hunt, of Mount Shasta, assessed fines totaling $225 and suspended sentences of thirty days upon five parties charged with taking an over limit of trout. The arrests in these cases were made by Game Warden S. R. Gilloon, of Mount Shasta, who was patrolling the north fork of the Sacramento River in the vicinity of Weed and happened upon the five men, each claiming the legal catch of fish. Gilloon dropped down the road a few miles and paid the same party another call, this time finding them with thirty-five fish over the limit.

The entire party was conveyed into Mount Shasta, where they entered pleas of guilty to the charges against them and asked for a certain period of time to raise the money to pay their fines, which was granted.

Antone J. Anderson, of Crockett, California, entered pleas of guilty to two charges of illegal netting lodged against him in the court of Justice Ray Griffin, of Redwood City. He was assessed fines of $100 each on the two counts and forfeited to our fish and game deputies two fine nets, each more than one mile in length and valued at about $1,000.

One case has been pending against Anderson in the Redwood City court for more than a year past, or since Patrol Captain M. S. Clark, of San Francisco Bay District, and Patrolman Jack Burke, of San Mateo, charged him with use of an illegal net and of using it in an illegal manner. He was tried and the jury disagreed, but the game patrolmen only redoubled their efforts to catch him.

At 4 o'clock on the morning of April 28, 1926, after a vigil of more than twenty-six hours, Patrolman Burke and his son, George Burke, San Mateo high school student, caught Anderson a second time, again using an illegal net fastened to the shore in violation of the law.

Anderson at first elected to fight the second case, but later decided that Deputy Burke's evidence was too strong, and pleaded guilty.

Warden S. F. Gilloon, of Mount Shasta, arrested four Japanese in the act of killing doves and robins out of season. Judge H. I. Williams, of Cassel, assessed a $100 fine against each man.

Captain William Lippincott arrested a man with five quail, taken out of season. Judge A. F. Ross fined the man $100. Numerous other arrests have been made, and the deputies have received wonderful support from the local judges.

On the afternoon of August 16, Deputy C. L. Bundock, accompanied by Joe Maubert, Dick Pratt and Phil Hobson, three dollar-a-year deputies, came upon three men with 103 striped bass in their possession. The largest of these fish was nine inches in length, which is three inches below the legal limit.

The men were taken before Judge Wade Moore, of Pittsburg, who served a twenty-day suspended sentence upon them, on the plea that they were too poor to pay the fine. Two of the men were carpenters and the third a truck driver.

Such irregular procedure is neither fair to the sportsmen nor to the deputies, for it is undoubtedly most discouraging to work hard on a case and at the last moment to have it waived aside as a matter of no consequence. These men should have been made to pay for such a gross violation of the law.

Department of Fish Culture.

A sum of money for the rehabilitation and enlargement of the famous Mount Shasta Hatchery, which has furnished California sportsmen with many millions of trout, has recently been allotted by the California Fish and Game Commission. The principal innovations will be: new hatchery buildings, a new and improved food-grinding and food-cooking plant, refrigeration plant, power plant, new walls for all the ponds, new screens and fishways.

FIG. 40. Deputies of the Fish and Game Commission visit the State Game Farm on March 7, 1926, and are introduced to the science of game propagation. Photograph by H. C. Bryant.

When the large force of workmen now employed at the Mount Shasta Hatchery has finished its labors, the enlarged plant will be capable of increases of from 5 to 25 per cent in capacity. This season the plant is handling 200,000 brood fish, and will turn over to the fish planters something in the neighborhood of 14,000,000 fry this fall.

Four principal varieties of trout are propagated at Mount Shasta, the Loch Leven and German brown for the lower altitudes and warmer waters, and the famed California rainbow and eastern brook varieties for the higher altitudes and cold streams. Steelhead trout and

chinook salmon are likewise propagated here, and the resultant fry permitted to run to sea from the hatchery itself.

While the brood fish have largely been Loch Leven, German brown and eastern brook trout in the past, a considerable stock of rainbow brood fish is being collected at Shasta Hatchery under the direction of Captain G. H. Lambson. Captain Lambson has been in charge of the hatchery since 1919, prior to which time he was for many years in the employ of the Federal Bureau of Fisheries, as pilot of a fish distribution car, and still later in charge of the government hatchery at Baird, California. He is personally overseeing the improvements now under way, bringing to the project the results of his many years of training and study.

From a very small plant of seven ponds and one building, Mount Shasta Hatchery has developed to such an extent that it now comprises 52 ponds, 15 hatchery buildings, cottages for the superintendent and the permanent employees, a hydro-electric plant, a water plant and other appliances necessary for the propagation of young fish, especially constructed fish cars and tin cans used for distributing fry to the various planting centers.

With the increased facilities at its command, Mount Shasta Hatchery should, in the year 1927, be capable of handling about 250,000 brood fish, and producing at least 17,500,000 fry.

A total of 1,000,000 fingerlings, the product of the Bear Creek Hatchery, have been planted in the streams of San Bernardino County. A number of improvements, including a fish pond, have been added to the above hatchery.

A holding pond that will care for 100,000 fish has been built at the Fort Seward Hatchery, about 300 feet below the hatchery building. The fish in this pond will be held until late in the fall before they are planted.

About 100,000 trout are being held until fall in ponds at the Brookdale Hatchery. Another 150,000 will be placed in the ponds as soon as the fish are sufficiently mature.

During the month of June, the Mount Whitney Hatchery received 500,000 golden trout eggs from Cottonwood Lakes. This is about the normal take. The Rae Lakes station produced only 150,000 rainbow eggs, a total far short of that of former years.

Two hatcheries and three egg-collecting stations were operated in Plumas County. Low water was responsible for a less than normal take of eggs. The take was smaller by 613,000 than that of last year.

The new plan of fish planting is now beginning to bear fruit. All sportsmen's organizations so far approached have endorsed the plan and there is not a single dissenting voice. In every possible instance captains of patrol have met the fish car and aided local sportsmen in their plantings. The result has been that there is less loss of fish this year than in previous years.

The experience with holding ponds maintained by sportsmen has not been encouraging. Even though funds were at hand for feeding and caring for the fish, this necessary duty was too often entrusted to untrained men with disastrous results. It is becoming more apparent that a holding pond can only function properly under the care of a trained fish-culturist. If this be true, holding ponds should be located at or near hatcheries so that careful supervision will be possible.

Department of Commercial Fisheries.

The albacore season was almost a failure. In order to secure fish, canners offered $240 a ton, but with poor success. Albacore were occasionally seen but could not be induced to take the hook, the only known practical manner of catching them. As a consequence, it is not to be inferred that the supply is depleted but that abnormal conditions existed which prevented the normal catch.

The catch of blue-finned tuna, however, was the best of any year with the exception of the year 1918. Skipjack were plentiful. Canners consequently utilized these fish instead of albacore.

Likewise the salmon trolling season has been poor. Many fishermen having depleted their financial resources in unsuccessful search for fish, have had to secure loans and are deeply in debt. Owing to the small catches, the tagging work has been a great disappointment. It was hoped that a sufficient number of troll caught salmon could be tagged to assure evidence as to where these sea caught salmon go to spawn. So few have been tagged, however, that worthwhile results can hardly be expected.

The Pismo clam situation has claimed the attention of the department the past

summer. Local residents, noting depletion, are demanding prohibition of commercial digging but continuance of sale in local restaurants. If the commercial digger is responsible, the effective method is to stop all sale. However, there is much evidence to show that it is the tourist digger of clams who takes the largest toll. Past shipments and even past sales of Pismo clams have formed but a small portion of the total catch. Perhaps the most feasible method of giving this shellfish better protection would be the creation of a closed area to be set aside as a spawning refuge. If properly chosen, such an area would assure a breeding stock.

Plans are being matured for the gathering of statistics relative to the rock cod fishery at San Pedro, which plays an important part in supplying the market with fresh fish. The statistics will cover size, percentage abundance of each principal species in the catch, locality, gear and methods. Although the sardine work is engaging the attention of the laboratory staff, yet investigations of this kind carried along with the other work are insurance for the future.

Bureau of Education and Research.

During the past summer more than 50,000 persons heard wild life and conservation lectures in Yosemite National Park. Field trips gave intimate contact with vacationists and a chance to stir their interest in conservation. A wide variety of trips was offered by the nature guides, ranging from short two-hour trips to whole-day trips. Weekly trips to the back country constituted a real trail school.

Extension of summer resort educational work to California State Redwood Park marked another advance in the program. Attendance at the 24 lectures amounted to 16,800 and 1712 persons followed nature guides on the 65 field trips offered during the month of July.

Bureau of Pollution.

The director of the Bureau of River and Harbor Pollution reports that conditions as regards the pollution of rivers and harbors of California have improved materially in the past three months. The bureau, created since the reorganization of the commission shortly after the first of the current year, has taken particular cognizance of cases of pollution by gas houses, oil wells, refineries and distilleries. Reports which have come in from virtually every section of the state have been investigated and remedial action demanded. In most cases this was forthcoming without the necessity for court action. In others it became necessary to file proceedings at law to force action.

Robert J. Irvine, a graduate chemist and bacteriologist, has been added to the staff of the pollution bureau. With his assistance a comprehensive analysis of all polluted waters is prepared for presentation to the proper authorities, upon which to base prosecution under section 635 of the Penal Code.

While conditions have greatly improved in recent months, there are numerous other cases and conditions in various communities that must be cleaned up before California waters can be said to be wholly safe for fish, plant and bird life. Those responsible for pollution are always given an opportunity to rectify conditions first. Failing in this the pollution bureau does not hesitate to take action.

Pollution of the waters of Hopper Canyon, in Ventura County, is to be stopped immediately, and every effort will be made to prevent a recurrence of conditions, according to a letter received by the Bureau of River and Harbor Pollution, from Hugh Grant, of the Julian Petroleum Company, Los Angeles. The Julian Company has large oil properties in the Hopper Canyon region, and conditions there were recently described as the most serious in the state.

All other sections of Ventura County having been freed of oil pollution, officials of the commission placed the Hopper Canyon matter before Mr. Grant in the light of a requisite of true sportsmanship, it being shown that fish were unable to live in the waters of the canyon below the properties of his company. In his letter Mr. Grant says: "I want you to know that I will give you my hearty cooperation along these lines, and I realize as a sportsman the value of the work you are doing."

From one of the worst polluted counties of the state, Ventura has risen to one of the cleanest.

Officials of the pollution bureau announce that this is generally true and they state that in the event of an accident, and the inadvertent dumping of

quantities of oil into California waters, officials of the offending company use every effort to clean up conditions as rapidly as possible.

Investigations at the "Bully Hill" Mine at Winthrop, California, operated by the California Zinc Company, showed that the plant was using an oil flotation method and cyanide in small quantities, the polluted mass of water and silt being allowed to run first into a settling basin, from which the water and oil were discharged into Squaw Creek. When conditions were called to the attention of Superintendent James J. Dugan and Foreman J. F. McDonald, these officials at once agreed to construct a new flume to carry all tailings from the mill across a considerable area and into a natural reservoir having no outlet into the creek.

About thirty days will be required to complete the new tailings disposal plant, following which the waters of Squaw Creek, from the mine to the junction of Pit River, will again become a splendid fishing stream.

Bureau of Screens and Ladders.

The Bureau of Screens and Ladders is installing a large map which will show the location of every screen and ladder in the state. A card index will record all of the details. Other pertinent data will be indicated on the map. As a result, there will be no recurrence of the former inadequate knowledge of the condition and location of screens and ladders.

During July, 45 screens and 15 ladders were inspected. In most instances the complete cooperation of owners has been secured.

Fish heretofore blocked from the upper part of the south fork of the Trinity River were offered a new, free passage this summer after dynamite had blown out a passageway through an old dam.

One of the first problems to confront the newly created Bureau of Screens and Ladders was an obstruction in the south fork of the Trinity River. The Little Klondike Hydraulic Mining Company has erected an artificial barrier, 30 feet in height and 100 feet long, thus closing the river completely to the annual run of steelhead trout and salmon, as well as to the rainbow trout, a fish which is a native to these waters.

After a series of conferences with officials of the company, and an appeal to their sense of true sportsmanship, they willingly agreed to open the obstruction, thus permitting the usual run of fish. This was accomplished on July 10, without recourse to law, and much to the delight of the sportsmen's associations and fishermen from all over California who frequent the Trinity River country in search of their favorite sport.

Another instance of the activity of the bureau is cited. In the Eel River, near Grizzly Butte in Humboldt County, a jetty was built some years ago to prevent erosion of the right bank. Unfortunately this interfered with the annual run of salmon and steelhead trout. Inasmuch as the jetty seemed now to be serving no purpose, Mr. Spencer, with the assistance of the Patrol Department, caused to be removed two large slabs of concrete, thereby clearing the hitherto obstructed stream.

Bureau of Game Farms.

Superintendent Bade, in addition to caring for the hatching and rearing of the many young pheasants, has been busy selecting suitable places to plant the output of the Yountville Game Farm. Several locations in the Sacramento and San Joaquin valleys have been found satisfactory, and young birds have been liberated. Redding and Stockton have both received shipments.

The birds at the farm have survived the hot weather (the temperature reached 109 degrees during the summer) because provision was made for their comfort. Oak brush was cut and placed in the cages for shade and the sprinkler system gave an effective means of reducing the temperature within the pens.

The first planting of pheasants from the State Game Farm took place on August 11 at Redding. A careful selection of a suitable locality had been made and a considerable gathering of sportsmen were at the station to meet the birds. A total of 231 birds, just ten weeks old, were shipped under the supervision of E. H. Lewis, assistant superintendent of the State Game Farm. Three different plantings were made in the bottom lands along the Sacramento River near Redding. Good food and splendid cover are available for the birds. Those present at the liberation were pleased to find that the birds were really wild birds and not domesticated ones. As soon as the ship-

ping boxes were opened, the birds immediately flew to cover.

Great interest taken in this plant by sportsmen of the vicinity insures rigid enforcement of the closed season. Successful results may only be expected under these circumstances.

Later in the fall numerous other plantings were made, notably a large one near Stockton. Although many of the birds planted this fall have been able to care for themselves, it is the plan to plant the birds when only two weeks old. The young pheasants are to be sent out with the mother hens and cared for by interested sportsmen on the ground where they are to be liberated. In this way, they learn the territory when they are young and quickly discover the food supply and learn the places of safety. This method will greatly facilitate the work of the game farm and increase the production.

The Southern Pacific Company has very generously offered to transport, without charge, the pheasants from the game farm to the various points of distribution. Many birds, however, have been trucked to their destination.

State Lion Hunter.

Mr. Jay C. Bruce, state lion hunter, reports that eleven lions were killed during the six weeks ending August 31. During this time he has been hunting in the El Dorado National Forest between the north fork of the Mokelumne River and the Rubicon. On one occasion some of his dogs were badly mauled when a lion turned at bay and gave fight. Mr. Bruce's next trip will be to the country in the vicinity of the American River, where four lions have recently been reported.

LIFE HISTORY NOTES.

PREY OF THE VERSATILE RAINBOW.

Some years ago, while fishing in a small mountain stream in Plumas County, I landed an 11-inch rainbow trout whose greatly distended belly prompted an immediate investigation with my pocketknife. The operation disclosed a mouse-like creature which I first thought to be a shrew, but upon examination its disproportionately long hind legs and tail showed that it was one of the jumping mice. Being an adult specimen, it seemed rather large game for a trout of this size.

Upon another occasion I took from the same stream a much smaller rainbow whose stomach contained a ripe berry of the Western mountain ash (*Sorbus sitchensis*). The tree itself overhung the stream at a point a little above where the fish was lying, and there were many birds feeding upon the berries and knocking them from the branches. The fruit of this tree is coral-red and about a third of an inch in diameter, somewhat resembling a magnified salmon egg, but in this connection it is worthy of note that in seventeen years I have never known of a single case in which a salmon egg was successfully used as bait for trout in this particular stream.

Recently I opened the stomach of a rainbow trout thirteen inches in length which I had taken from the murky waters of the McCloud River, seven or eight miles above Baird, and was greatly surprised to find not only a 4½-inch sculpin or "bullhead" (*Cottus shasta*) but also a young bird in the pin-feather stage. I was unable to identify the latter with certainty, but in size and general characteristics it resembled a young vireo.—W. I. Follett, Oakland, California.

SHRIKE ATTACKS YOUNG QUAIL.

Mr. James L. Ortega writes as follows:

"About 8 o'clock one morning while working in a prune orchard, about a mile and a quarter north of Yountville, Napa County, California, I heard a chirping noise very similar to the chirp of a young chicken. I noticed two birds on the ground some distance from me. The noise was proceeding from their direction. I noticed that one bird seemed to be larger than the other. The larger was flying at the smaller, which was dodging from side to side and chirping. This was in the orchard on bare ground and some distance from cover.

My curiosity was aroused, and I went near to get a better view. Then I noticed that the larger bird was a shrike, and the smaller a baby quail, scarcely able to fly. The shrike became alarmed at my near approach and flew up into a prune tree, whereupon the young valley quail started to run away from the spot where the shrike had attacked it. After running for a short distance it took to the air, rising to a height of a foot or so above the ground. After flying for a hundred feet or thereabouts it alighted and ran to cover, and so out of sight. I saw no

more of either the young quail or of the shrike.

Once before, several years ago, in 1919 or 1920, I noticed a shrike (in Merced County, California) trying to catch a very young chicken. The mother hen flew to and fro trying to drive the shrike away. However, I believe this is the first instance in my experience of a shrike attacking young quail. I did not see the beginning of this particular incident, so I do not know how the shrike got the little quail away from the cover of the weeds, so far into the orchard.

I do not intend this to be a condemnation of the shrike for I am fully aware of the fact that this bird does do much good in the way of catching insects; and I have even seen small mice and lizards hanging up in some favorite spot of a shrike. The lizard was of the fence lizard type, and was presumably one of the beneficial species.

The attack on the young quail was not provoked by lack of insect food, for in the adjoining field there were numerous grasshoppers of sufficient size to attract the attention of the shrikes."

With reference to the above observation, the following quotation will both confirm this and show to what extent this habit prevails. We quote from "Birds of California in Relation to the Fruit Industry," Bulletin No. 30, Biological Survey, U. S. Dept. of Agriculture:

"In the investigation of the food of the California shrike, 124 stomachs were examined. They were collected in every month, but the greater number were taken in the warmer months.

Vegetable food. Animal food of all kinds amounts to 97.5 per cent, or so nearly the whole that it is fair to suppose that the greater part of the 2.5 per cent of vegetable matter present was swallowed unintentionally—that is, when sticking to something else. All of it was contained in 9 stomachs. Fruit appeared in 2 stomachs, seeds in 2, and rubbish in 6. Of these probably only the fruit was taken as food. One stomach was filled with elderberries to the amount of 84 per cent of the contents, the other with the seeds of blackberries or raspberries to the extent of 13 per cent. It thus appears that the shrike sometimes eats fruit.

Animal food. The animal portion of the shrike's food may be divided into three parts: Insects, 83 per cent; spiders and a few snails, etc., 2 per cent; vertebrates, 12 per cent.

Of insects eaten by the shrike, the largest item is Orthoptera—that is, grasshoppers and crickets—which amount to nearly 43 per cent of the whole food. They are eaten in every month of the year, and in August and September reach nearly 70 per cent. These are the normal grasshopper months, the ones in which eastern birds enjoy their annual grasshopper feast. Ordinary grasshoppers form the greater part of this item of food, but a good many crickets are eaten, especially the brown and striped so-called wood crickets.

Vertebrates. The vertebrate part of the shrike's food amounts to a little more than 12 per cent, and consists of the remains of small mammals, birds and lizards. Mammals were found in 4 stomachs, birds in 2, and lizards in 12. Neither of the birds could be identified further than that both were small song birds. Of the mammals, one was a pocket mouse (Perognathus), one a young field mouse (Microtus), and one a shrew (Sorex). The fourth mammal could not be identified, as there was little left except hair. The lizards were not recognizable either generically or specifically, as the remains consisted only of bones and scales. From an economic standpoint, lizards are useful animals, as they subsist on insects. The same is true of birds, so that in destroying birds and lizards the shrike is doing harm. Fortunately, it does not eat many birds. The destruction of the mammals is an unmixed blessing, except, perhaps, in the case of the shrew (Sorex), which is largely insectivorous. Even if all the above vertebrates were useful the score against the shrike would not be a very heavy one and would not outweigh the value of its services in destroying grasshoppers. In the writer's field experience with the shrike only one attempt to capture a vertebrate animal was observed. In this case the shrike was seen to plunge into a thicket of weeds in pursuit of a brood of tiny quail, but a few seconds later it emerged in a great hurry, closely followed by the irate cock quail. As a matter of fact, the noxious mammals eaten both by the eastern and western shrikes far outnumber the birds, and when to the former are added harmful insects the balance is very largely on the credit side."—H. C. Godsil, Berkeley, California.

GRAY SQUIRREL DISEASE STILL EXISTS.

The serious epidemic of 1920–1921 so effectively reduced the number of gray squirrels that in the intervening years the species has not had an opportunity to recuperate. For instance, in Yosemite Valley, where gray squirrels were once very abundant, but two or three have been seen in the past two years. No doubt the species will eventually return to normal numbers, but continued protection is needed. One reason for the slow increase in numbers may be found in the fact that the disease is still prevalent in some places. A recent report from Twain, Plumas County, made by W. I. Follette, is to the effect that early

last summer a dead gray squirrel was discovered a few miles east of the McCloud River in Shasta County. Its head, particularly about the eyes and snout, was covered with scab and gave every evidence of the same disease which made such inroads a few years ago.—H. C. Bryant, Berkeley, Cal.

YOUNG ANTELOPE RESCUED.

One day last May a baby antelope wandered into the town of Mount Hebron with his nose full of porcupine quills. Some men found him and succeeded in ridding him of the quills. In that the animal was hardly capable of taking care of himself, he was kept in captivity for a time. The accompanying photograph shows the animal while in captivity.—Wm. Lippincott, Yreka, California.

CONSERVATION IN OTHER STATES.

OREGON COMMISSION ABLE TO CLOSE STREAMS.

The Oregon Fish and Game Commission has plenary powers and consequently is able to protect young fish in the streams. After planting tributary streams, these streams are closed to fishing until the planted fish have attained proper size. With the same authority the commission is able to mark a portion of a lake with buoys and make it a fish refuge. It is a common thing in Oregon to find one part of a lake open to fishermen and another part closed. This assures a breeding stock being left in the lake after the angling season. When private landholders refuse to allow fishing on their premises, the Oregon commission promptly closes the area to all fishing and the owners are also deprived of the privilege. Soon there is a change of heart and a request for the opening of the area to fishing. California needs similar discretionary powers to adequately care for natural resources.

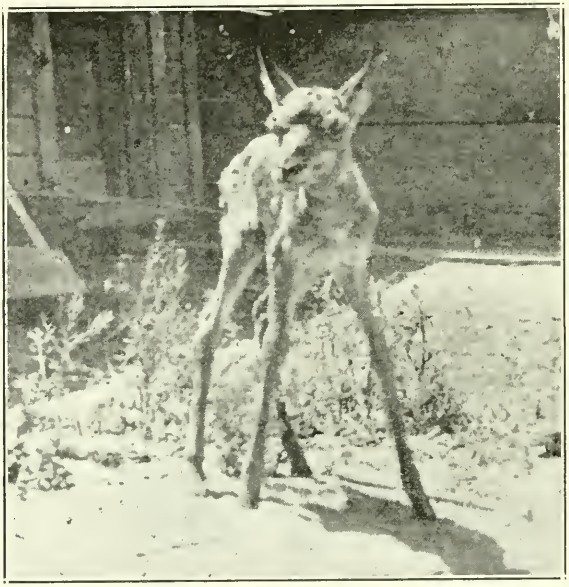

FIG. 41. A young antelope, rescued near the town of Mount Hebron, Siskiyou County, and reared for some time in captivity. Photograph by Wm. Lippincott.

STREAM POLLUTION IN OREGON.

In November, 1925, the Oregon State Game Commission initiated a movement to prevent further pollution of the streams of this state. Notice was served on all the cities and towns discharging their raw sewage into streams that they would be expected to plan immediately for the

installation of sewage disposal plants. Towns without present sewer systems were advised that as they constructed new sewers they would be expected to comply with the law and provide adequate sewage disposal plants.

In furtherance of this program there was recently formed in Portland the Oregon Anti-Stream Pollution Committee. This is composed of representatives from the State Board of Health, the State Game Commission, the State Fish Commission, the Salmon Protective Association, the State Sportsmen's Association, the Multnomah Hunters and Anglers Club, the Association of Engineers of Willamette Valley Cities and the United States Bureau of Fisheries. This organization is now actively engaged in backing up the game commission in its efforts to prevent the towns of Milwaukee and West Linn from installing new sewer systems which will discharge raw sewage directly into the Willamette River. The Attorney General has been asked to enjoin these towns from proceeding with their construction work until their plans provide for the proper treatment of their sewage.

It is thought by the members of this state wide committee that it is illogical to permit further pollution of the Willamette River at a time when the cities of Eugene, Albany, Salem and Portland are taking active steps to undo the harm that has already been done. These cities are all considering the installation of modern sewage disposal systems just as rapidly as their plans can be worked out and finances become available.

Following out the recommendations of H. B. Hombon, sanitary engineer in charge of United States Public Health Service at San Francisco, the State Board of Health is conducting a series of tests in the Willamette River from above the city of Eugene to the city limits of Portland. Similar tests are being conducted by Portland in the Willamette River within the city limits. The Oregon Anti-Stream Pollution Committee is cooperating with the State Board of Health in this work. If the results of these tests show that the health of the citizens is being menaced by the pollution of the river the work of changing the sewer systems along this stream will be greatly hastened.—*The Oregon Sportsman*, July, 1926, page 8.

MASSACHUSETTS GAME FARM ADOPTS NEW SYSTEM.

Massachusetts has recently adopted the method of pheasant propagation utilized by the English breeders. Birds are controlled by the use of the brail. The brail is a Y-shaped piece of leather or rubberoid, and is riveted around one wing in such a way as to prevent flight. The device will permit carrying large numbers of birds in open pens, whereas the work heretofore has been confined to covered pens. The result will be more economical operation, and the production of a stronger and better bird by reason of the greater freedom and variety of food made possible by the larger range. It has been found that on removal of the brail the bird has full use of its wings. The brail is occasionally shifted from one wing to the other. It has the advantage over the method of clipping the flight feathers, in that the bird is in condition for liberation at any time should this become desirable.

OREGON SUCCEEDS WITH HUNGARIAN PARTRIDGES.

It has taken many years of experimentation to attain success in propagating Hungarian partridges. Perhaps the best results yet obtained may be credited to the Eugene Game Farm in Oregon. Six hundred birds were reared during the past season. Success is credited to the method of holding birds sufficiently long to acclimate and domesticate them. California has been promised some of the breeding stock.

MONTANA REPORTS ACTIVITIES.

According to the 1923–24 report of the Montana Fish and Game Commission, this state is stocking its streams heavily with the Loch Leven trout. Through an exchange with the Oregon Fish and Game Commission, Montana will secure 2,000,000 eggs, and 3,000,000 more are to be secured from the United States Bureau of Fisheries. One section of the Missouri River is becoming a rival of the Madison River as a Loch Leven and rainbow stream.

Attention is called to the need for protection for fur-bearing animals. Martens are nearly extinct and other species need better protection.

The educational campaign is beginning to show results. Many people who were living their lives without thought or interest in the Montana Fish and Game Department except to secure the greatest possible returns for the money paid for the hunting and fishing licenses, are now giving time, constructive thought and service to the sportsmen's program. Another result is to be found in the desire generally manifested to acquire a true knowledge of all the facts pertinent to efficient game management.

CANADA TO PROTECT ANTELOPE.

In line with efforts being made in the United States to give better protection to the prong-horned antelope, Canadian provinces are undertaking to save from extermination the antelope within their jurisdiction. The game commissioner of Saskatchewan is striving to educate and interest the people of that province in antelope conservation and is stressing law enforcement.

MISSOURI PLANTS GRAIN IN STATE REFUGES.

Crops of corn, clover, oats, cow peas, millet, rutabaga, alfalfa, sunflower and soy beans have been planted in Missouri game refuges to furnish food for wild game. All tillable land in adjoining sanctuaries is being used. Although a portion of the grain will be harvested for use in winter feeding, yet most of it will be left standing as a source of food supply for game within the refuges.

MONTANA PLANTS DUCK FOOD.

Indictment that state game authorities devote their time and attention solely to police work can not hold against the State Game and Fish Commission of Montana, as that state is actively engaged in planting the marshes frequented by waterfowl with all varieties of duck food plants.

At a recent meeting of the Western Montana Fish and Game Association held at Missoula, Chairman Thomas N. Marlowe of the State Game and Fish Commission told the sportsmen present what had been done in this respect during the recent months. He stated that $2,700 had been spent during May for duck foods which were being planted in the lakes and reservoirs of the Flathead Valley along the Flathead Lake and in the Kalispell district. This was to be followed by plantings in all the lakes and ponds in other parts of the state where such plants will thrive.

Experiments have been conducted during the past year to show what plants are best suited to different localities.

Montana has also made some large importations of Hungarian partridge from Europe which have been liberated in various sections of the state during the past spring. It is constructive work of this character which brings results in more sport and better shooting.

MISSOURI HAS UNIQUE LAW.

Protection for spawning fish in Missouri depends upon a season from April 10 to June 1, when it is illegal to use artificial bait of any description. This law was designed as a protective measure for stream fish during the spawning season. Apparently the emphasis on artificial bait does not preclude the use of natural bait, which most anglers claim is the more destructive of the two methods.

WISE INVESTMENT BY WISCONSIN.

The state of Wisconsin, through its conservation commission, has recently made possible an emergency appropriation of $90,000 for the purpose of developing and protecting the natural fish spawning grounds of the Mississippi River.

The use of the commission's reserve funds for specific conservation work has been authorized by the emergency board, consisting of the governor, secretary of state and state treasurer. Much of the amount is to be devoted to fish propagation activities.

Numerous desirable spawning grounds along the Mississippi River have been selected for the purpose of "developing the greatest fish propagation ponds in America," according to Conservation Commissioner Hall, and $20,000 of the emergency appropriation is to be used for the acquisition of new hatcheries in that territory.

The brook trout hatchery at Westfield is to be enlarged, and the emergency appropriation also contemplates $25,000 for additional conservation warden service and $40,000 for equipping additional forest fire districts.

The federal government is acquiring bottom lands for the new Upper Mississippi River Wild Life and Fish Refuge, and it is the aim of the Wisconsin commission to preserve suitable spawning grounds for fish propagation by the state.

The sloughs and ponds along the upper Mississippi are regarded as the best bass breeding grounds in America, and millions of small fish have been rescued from the shallow landlocked waters annually by the United States Bureau of Fisheries and the state departments of Wisconsin, Iowa, Illinois and Minnesota for restocking lakes and streams.

MICHIGAN CLOSES GROUSE HUNTING FOR YEAR.

Following closing of partridge shooting in certain counties of Michigan last year, the State Conservation Commission has issued an order closing the entire state this year. This action is in line with the recommendation of the American Game Protective Association that during the prevailing scarcity of ruffed grouse close seasons be invoked to prevent destroying all the brood stock.

The shortage of ruffed grouse in some states is really alarming and great care should be exercised to preserve what few birds there are, otherwise their restoration will be indefinitely delayed. The region of the most serious losses from disease, or whatever may have been the cause of the sudden disappearance of the partridge, seems to include Minnesota, Wisconsin and Michigan. In the east the situation is not so serious, as many localities report an increasing number of birds. It is possible that New York, Pennsylvania and New England may be recovering from the grouse malady, while it appears to be at its peak farther west.

The Grouse Investigation Committee is carrying on its researches through the work of Dr, Allen of Cornell University and Dr. Gross of Bowdoin College and other scientists, and important facts are being brought to light. The committee needs more financial support, however, that its work may be carried to completion.

MISSOURI INCREASES HATCHERY FACILITIES.

Upon the completion of the present program, Missouri will have doubled the number of her hatcheries. Five new hatcheries are now in process of construction. These will augument the four hatcheries now in operation. Missouri boasts of the second largest pond culture hatchery in the United States. As is so often the case, great difficulty was experienced in securing suitable locations. A location free from flood water, soil that will hold water, and suitable drainage conditions, in addition to an appropriate and economic water supply, are essential requirements. The new hatcheries will be used for the propagation of bass, crappie, goggle-eye and blue-gills.

MISSOURI INTRODUCES WHITE-TAILED DEER.

A sum of $2,500 was recently appropriated by the Missouri Fish and Game Commission to be invested in Virginia deer for stocking game refuges, Fifty deer were procured on the basis of one buck to two does from a 13,000-acre preserve on Grand Island in Lake Superior. Fifteen additional animals are to be secured for the Taney County game preserve. Missouri, like Pennsylvania, surrounds her refuges with a single strand of smooth wire.

REPORTS.

Violations of Fish and Game Laws.

GAME CASES.

April-May-June, 1926.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Hunting License Act	4	$90 00	----
Deer: hunting, killing, possession, closed season	10	700 00	210
Deer: killing, possession; does, fawns, spike bucks	3	250 00	180
Ducks: killing, possession, closed season	6	25 00	150
Geese: killing, possession, closed season	2	------	----
Doves: killing, possession, closed season	4	85 00	----
Wild pigeons: killing, possession	4	125 00	30
Quail: killing, possession, closed season	7	245 00	----
Pheasants: killing, possession	1	25 00	----
Night hunting	1	25 00	----
Rabbits: cottontail-brush; killing, possession, closed season	14	335 00	30
Squirrels: killing, possession	3	75 00	----
Shooting game from automobile	3	70 00	----
Non-game birds: killing, possession	2	35 00	----
Game Refuge: hunting, possession of firearms	1	25 00	----
Totals	65	$2,110 00	600

FISH CASES.

April-May-June, 1926.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Angling License Act	26	$550 00	40
Violations of Commercial Fishing License Act	3	60 00	----
Trout: closed season or closed district	28	1,140 00	----
Trout: over bag limit	15	350 00	50
Trout: taken other than with hook and line	8	150 00	----
Striped bass: overlimit, undersized	5	110 00	----
Striped bass: shipment out of state	2	200 00	----
Crabs: selling meat out of shell	8	125 00	----
Crabs: transporting from District 1½	6	850 00	----
Crabs: female, possession of	1	------	----
Clams: closed season	1	25 00	----
Clams: undersized, overlimit	1	50 00	----
Abalones: undersized, overlimit	56	1,565 00	----
Salt water perch: sale, closed season	1	25 00	----
Salt water eels: undersized	1	25 00	----
Barracuda: undersized	2	45 00	----
Spotfin croaker: offering for sale	1	25 00	----
Black bass: closed season	4	100 00	----
Black bass: undersized	2	45 00	----
Sunfish: closed season	5	60 00	30
Shad: overlimit	3	60 00	----
Illegal night fishing	4	100 00	----
Game fish: taken other than with hook and line	5	50 00	150
Illegal fishing: 250 feet of fishway; 150 feet of lower side of dam	8	175 00	----
Nets, set lines: illegal possession or use	26	2,985 00	----
Pollution of streams	2	------	----
Totals	224	$8,870 00	270

SEIZURES OF FISH AND GAME.

April-May-June, 1926.

Ducks	5	Catfish	3
Doves	4	Shad, pounds	340
Wild pigeons	3	Salmon, pounds	48
Quail	7	Barracuda, pounds	1,619
Non-game birds	1	Spotfin croaker, pounds	132
Deer meat, pounds	50	Salt water perch, pounds	22
Rabbits	37	Pismo clams	35
Squirrels	3	Crabs	1,945
Trout	767	Crab meat, out of shell, pounds	10
Striped bass, pounds	1,166	Abalones	135
Black bass	5	Nets	10
Sunfish	35		

STATEMENT OF INCOME.

For the period April 1, 1926, to June 30, 1926.

	Detail	Total
License sales:		
Angling	$87,256 00	
Hunting	67,958 00	
Market fishermen's	20,960 00	
Trapping	497 00	
Wholesale fish packers' and shell fish dealers'	100 00	
Game breeders'	67 50	
Fish breeders'	25 00	
Total license sales		$176,863 50
Other income:		
Court fines	$10,436 75	
Fish packers' tax	38,010 40	
Fish tag sales	1,148 14	
Game tag sales	7 18	
Miscellaneous sales	25 00	
Abalone inspection	88 65	
Interest on bank deposits	567 53	
Total other income		50,283 65
Total income		$227,147 15

STATEMENT OF EXPENDITURES.

For the Period April 1, 1926, to June 30, 1926, of the Seventy-eighth Fiscal Year.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Administration:					
Commissioners	$3 37		$33 13	$12 60	$49 10
Executive and legal	56 79	$2,126 16	387 63	346 36	2,916 94
Clerical and office	26 59	5,182 16	271 07	689 85	6,169 67
Rent			1,705 43		1,705 43
Printing	2,267 85				2,267 85
Postage			547 62		547 62
Freight, cartage and express			407 21		407 21
Telephone and telegraph			1,177 62		1,177 62
Automobiles	172 75		59 55	123 99	356 29
Accident and death claims			3,101 75		3,101 75
Total administration	$2,527 35	$7,308 32	$7,691 01	$1,172 80	$18,699 48
Publicity and research:					
Director of education and research	$50 16	$1,381 45	$192 10	$903 50	$2,527 21
Director of publicity	6 79	1,061 88	99 71		1,168 38
Printing	2,631 50				2,631 50
Total publicity and research	$2,688 45	$2,443 33	$291 81	$903 50	$6,327 09
Conservation and protection: (Patrol and law enforcement)					
Chief and assistant		$1,849 98	$177 38		$2,027 36
Captains and deputies	$578 91	32 298 99	25,749 38	$480 00	59,107 28
Patrol launches	287 79	310 00	306 75		904 54
Clerical and office	3 83	1,770 00			1,773 83
Rent			80 64		80 64
Automobiles	269 74		83 81		353 55
(Protection)					
Lion hunting		375 00	275 96		650 96
Lion bounties			1,550 00		1,550 00
Total conservation and protection	$1,140 27	$36,603 97	$28,223 92	$480 00	$66,448 16
Commercial fisheries:					
Chief and assistants	$58 01	$1,830 00	$360 27		$2,248 28
Deputies	18 98	3,312 00	808 41		4,139 39
Laboratory research	641 30	4,662 72	965 05	$562 76	6,822 83
Statistical	405 70	1,110 00	18 41		1,534 11
Patrol launches	422 30	442 26	155 56	5,838 46	6,858 58
Salmon tagging	800 00		72 65		872 65
Total commercial fisheries	$2,346 29	$11,356 98	$2,371 35	$6,401 22	$22,475 84
Game propagation:					
Game farm maintenance and operation	$2,093 67	$1,656 08	$1,034 37	$1,701 75	$6,485 87
Additions and betterments				9,959 03	9,959 03
Total game propagation	$2,093 67	$1,656 08	$1,034 37	$11,660 78	$16,444 90
Fish culture:					
Chief of division		$950 00	$75 28		$1,025 28
Special field investigations	$122 18	2,400 00	699 49	$842 38	4,064 05
Clerical and office	43 52	915 00	6 80		965 32
Hatcheries maintenance and operation	17,741 42	23,113 30	2,562 07	987 44	44,404 23
Hatcheries additions and betterments				9,587 97	9,587 97
Automobiles	743 17		310 33	2,243 02	3,296 52
Rent			17 00		17 00
Total fish culture	$18,650 29	$27,378 30	$3,670 97	$13,660 81	$63,360 37
License commissions			$15,588 10		$15,588 10
Total expenditures	$29,446 32	$86,746 98	$58,871 53	$34,279 11	$209,343 94

CALIFORNIA FRESH FISHERY PRODUCTS FOR MONTHS OF APRIL, MAY AND JUNE, 1926.

Compiled by Fish and Game Commission, Department of Commercial Fisheries.

Species of Fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Mexican, brought into California via San Pedro	Mexican, brought into California via San Diego	Total Mexican brought into California
Albacore											230,701	1,410	165,348	397,459			
Anchovies									3,885		2,558			6,443			
Barracuda								3,141	322	16,660	887,434	41,288	770,806	1,719,651	496,290	175,304	671,594
Bonito									80	465	180,641	2,629	96,517	280,332	14,935	6,065	21,000
Carp		350		148	1,983	3,195	2,784							8,460			
Catfish		161		2,984	20,886	10,738								34,769			
Cultus Cod	8,945	3,433	398				117,236	21,665	12,950					164,627			
Eels							15				155			170			
Flounders	598	4,670	126	17		122	31,439	61,658			1,468		12	100,110			
Grayfish							11,830	475	155		12,997		50,672	76,129			
Hake							17,444	6,337						23,781			
Halibut	94,109	8,184	669				4,165	608	743	58,011	71,432		18,605	256,556	5,775	114,807	120,582
Hardhead												5,696		5,696			
Kingfish							2,141	12,909	4,348		56,055	39	561	76,056	20		20
Mackerel							733	5,549	272,857	6,645	472,182	36,828	70,832	865,626	1,377	800	2,177
Marlin									764		8,023			8,787			
Mullet													5,001	5,001		163	163
Perch	15,606	90	3,445			34	5,553	625	557		8,883	27	42	34,862			
Pike					8	116								124			
Pompano											1,908		242	2,210			
Rock Bass										1,365	95,623	5,158	75,445	177,591	2,530	4,142	6,672
Rockfish	8,621	3,540	74				319,653	322,531	301,356	9,403	622,679	10,585	358,010	1,956,452	335	330	665
Sablefish	9,916	1,370					14,866	4,629	113		1,155			32,049			
Salmon	1,190,548	180,088	26,083	23,467	132,890	163,131	32,156	9,746	39,185					1,806,294			
Sandabs		6,630					178,370	85,493	480		4,509			275,482			
Sardines							414,235		59,265		525,944		529,568	1,529,012			
Sculpin											21,918		769	25,687			
Sea Bass—Black										448	3,406	1,159	19,740	24,753	3,156	50,696	53,852
Sea Bass—White								2,279	78	10,907	136,969	2,450	11,246	163,929	21,293	97,140	118,433
Shad					69	3	7,169							7,241			
Shad—Buck				32,035	13,693	211,061	4,818							261,607			
Shad—Roe				37,517	20,284	313,118	4,564							375,483			
Sheepshead										650	14,164		1,351	16,165		165	165
Skates							25,987	17,874			4,975			48,836			
Skipjack									193		495	241		929	1,197,983	604,879	1,802,862
Smelt	7,452		8,508			1,915	23,727	14,656	33,341	18,880	51,689	821	1,564	162,553	500		500
Sole	320	62,120					1,144,434	908,198	117,037	27,196	926	1,421	114	2,261,766			
Striped Bass		17	60	7,581	49,687	60,823	36,527							154,695			

Suckers							1,226							1,226				
Swordfish											1,097		2,412	3,509		270	270	
Tomcod							625							625				
Tuna											231,113			231,113	99		99	
Tuna—Bluefin											2,185,364		280,332	2,465,696				
Tuna—Yellowfin											4,954			4,954	2,869,335	880,112	3,749,447	
Turbot			120											120				
Whitebait	31,908		12				2,842							34,762				
Whitefish											52,035		10,382	62,417	411	143	554	
Yellowtail										228	422,291	2,429	788,417	1,213,365	160,028	284,850	444,878	
Miscellaneous	65	3,400					6,663	1,867	13,761	54	31,698	1,079	150	58,737	275		275	
Total fish	1,368,088	283,053	39,495	103,749	239,500	764,256	2,411,205	1,480,240	861,470	150,942	6,350,531	113,260	3,258,138	17,423,927	4,774,342	2,219,866	6,994,208	
Crustaceans:																		
Crabs	[1]71,928		[2]8,088				[4]763,080	63,984	[7]528					[8]847,608				
Shrimps			287,734			4,300	147,388							439,422		17,421	17,421	
Spiny lobsters																		
Mollusks:									648,425	5,838				654,263				
Abalones														1,002				
Clams—Cockle		215	787											13,789				
Clams—Mixed	848	511	12,430							81,105				81,105				
Clams—Pismo														64,905				
Clams—Softshell		12	24,560			29,079	11,254				61			22,467				
Cuttlefish							5,793	365	16,248	25				3,411				
Mussels						60	2,076		1,250					[9]93,181				
Oysters—Eastern			[3]5,786				[5]87,395							2,992,971				
Squid									2,992,971									
Totals	1,440,864	283,791	378,880	103,749	239,500	797,695	3,428,191	1,481,589	4,520,892	237,910	6,350,592	113,260	3,258,138	22,638,051	4,774,342	2,237,287	7,011,629	

All amounts shown in pounds unless otherwise specified. Albacore and skipjack cleaned.

[1] 2,997 dozen.
[2] 337 dozen.
[3] 26,302 shell oysters.
[4] 31,795 dozen.
[5] 397,250 shell oysters.
[6] 166 dozen.
[7] 22 dozen.
[8] 35,317 dozen.
[9] 423,552 shell oysters

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 12 Sacramento, January, 1926 Number 1

45139

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1925 ABSTRACT CALIFORNIA FISH AND GAME LAWS 1926

WHITE SQUARES INDICATE OPEN SEASON — NUMBERS IN SQUARES ARE OPEN DATES

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	DISTRICTS	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT	NOV.	DEC.	BAG AND POSSESSION LIMITS, ETC.
DEER	1-11-4½ 23-24-25-26										15			No Does, Fawns or Spike Bucks Nor Forked Horned Muledeer in Dist. 1¼ No sale of Venison or Deer Skins Two Bucks per Season. See Notes 8-9-10-14-15-16
	1¾									15	15			
	2-21-3									14				
	4-4¾									16	15			
Rabbits—Cottontail and Brush	ALL													15 per day. 30 per week No limit in District 4
Tree Squirrels	ALL													Closed until September 1st, 1927
Elk, Antelope, Mountain Sheep, Sea Otter, Beaver*	ALL													Killing of Elk or possession of Elk meat a felony $1,000 fine for Sea Otter
Bear, Fur Animals	ALL										15			See Notes 11-12
Ducks, Geese, Jack Snipe, Mud Hens	ALL	15												See Notes 4-14-15-16
Rail, Wood Duck, Wild Pigeon, Shore Birds (Except Jack Snipe)	ALL													
Quail—Valley, Desert and Mountain	ALL EXCEPT 1¾													Valley and Desert 15 per day. 30 per week Mountain 10 per day. 20 per week
	1¾													
Sage Hen	ALL								15					4 per day. 8 per week
Dove	All Except 1-11¾-23¾													15 per day. 30 per week
	1-11¾-23¾													
Grouse	ALL										15	14		4 per day. 8 per week
Pheasant	4¾												7	6 per season
Trout (Except Golden), Whitefish	1-1½-2-3 4-4½ Lake Tahoe													Bag limit for taking and possession, 25 trout or 10 pounds and one trout or one trout weighing 10 pounds or over per day. For other restrictions See Notes 19-20-24 36-37-39 40-42 On this Card
	2+		14											
	23-24-25					30								
	See Notes 25-26													
	1¾ Winter													Bag limit for taking and possession, 5 trout regardless of weight per day
	2-3-10 Tide Water												15	
	2-21-10 Spear													Bag limit for taking and possession, 1 trout per day
Golden Trout	ALL						30				1			20 per day. None under 5 inches
Black Bass, Sacramento Perch and Crappie SEE NOTE 44 FOR DISTRICT 4¾	ALL													25 per day. No Black Bass under 7 ins.
	Clear Lake in Lake Co.													Clear Lake 10 per day. No sale Hook and line only
Sunfish	ALL													25 per day. Hook and line only
Striped Bass, Shad	ALL													See Note 23
Salmon	15						15							See Note 27 for other districts, limit etc.
Crabs	ALL							30				15		See Note 28
Abalones	ALL	14			16									See Note 33
Pismo Clams	17													See Note 32
Spiny Lobster	ALL										15			See Note 29

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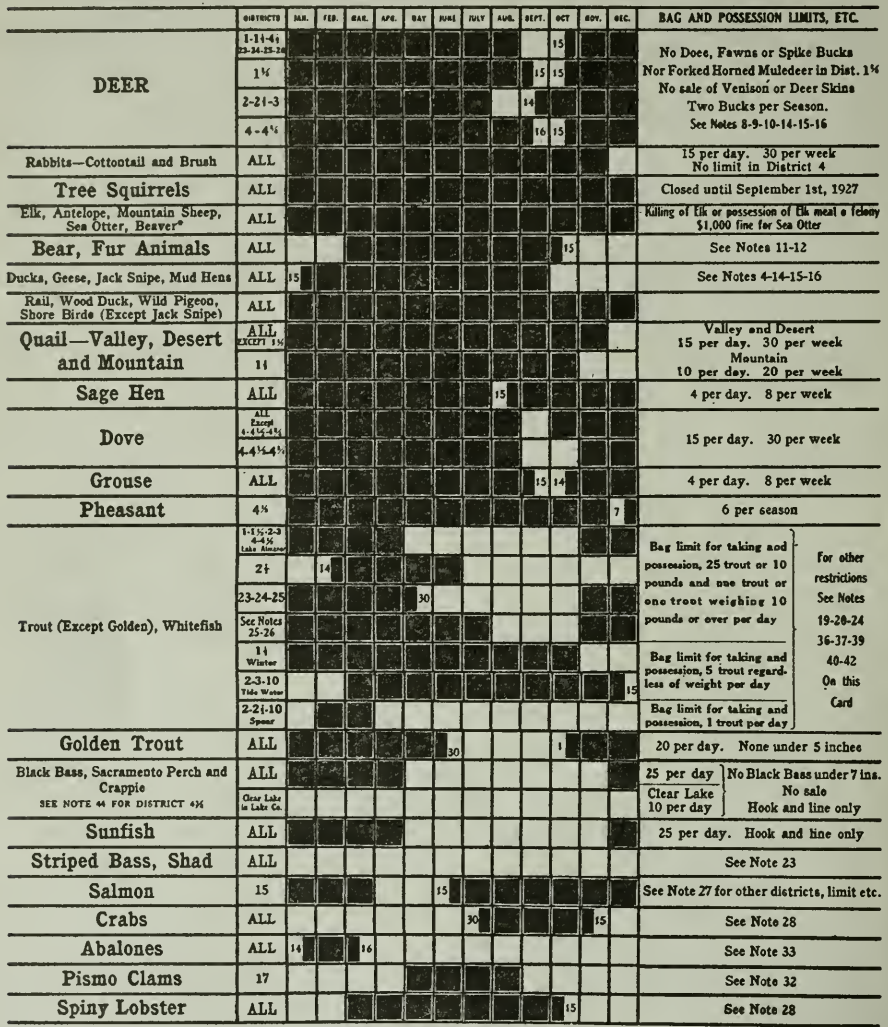

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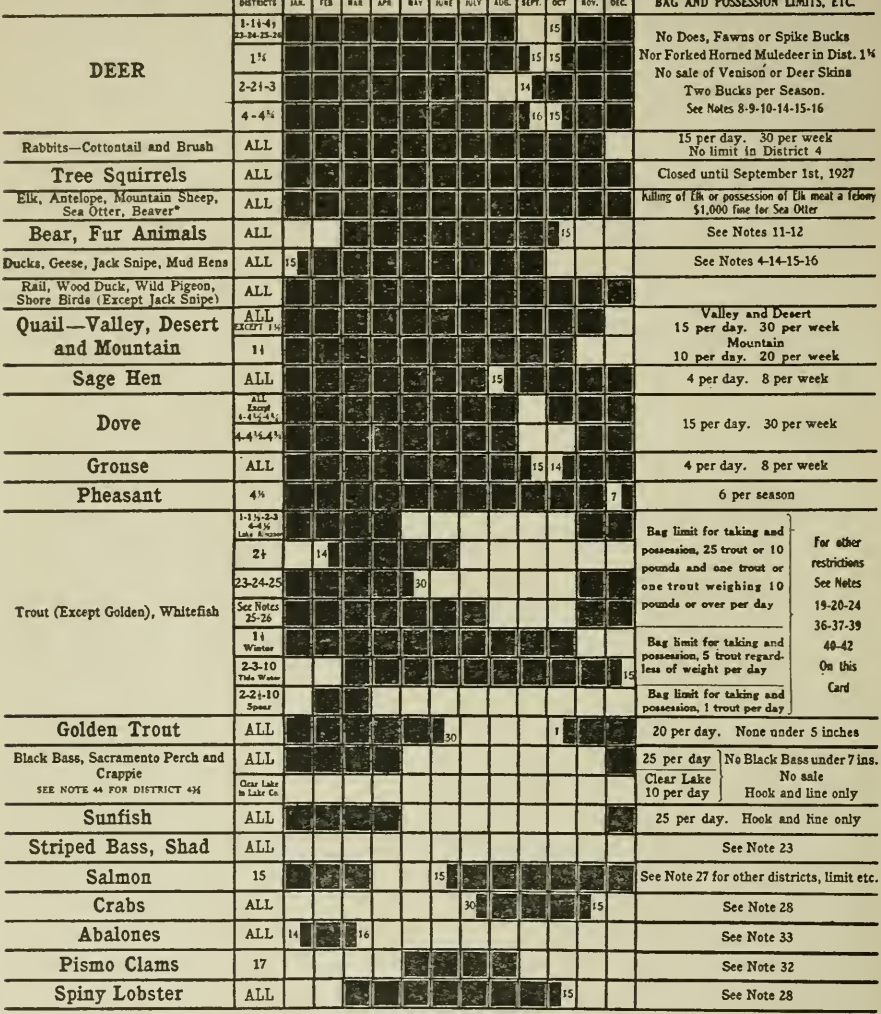

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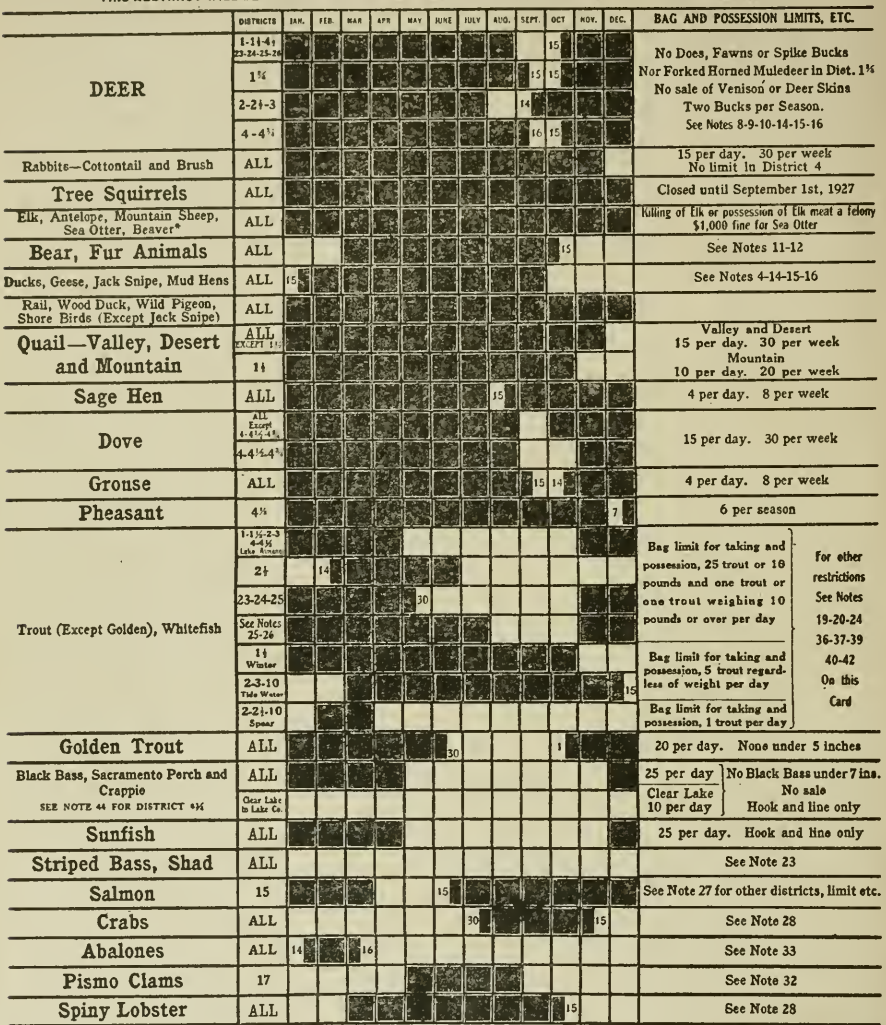

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